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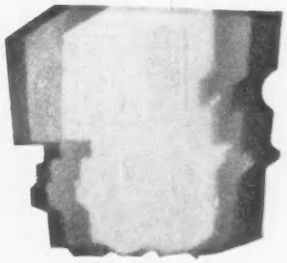

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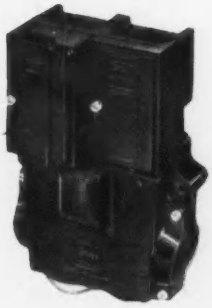

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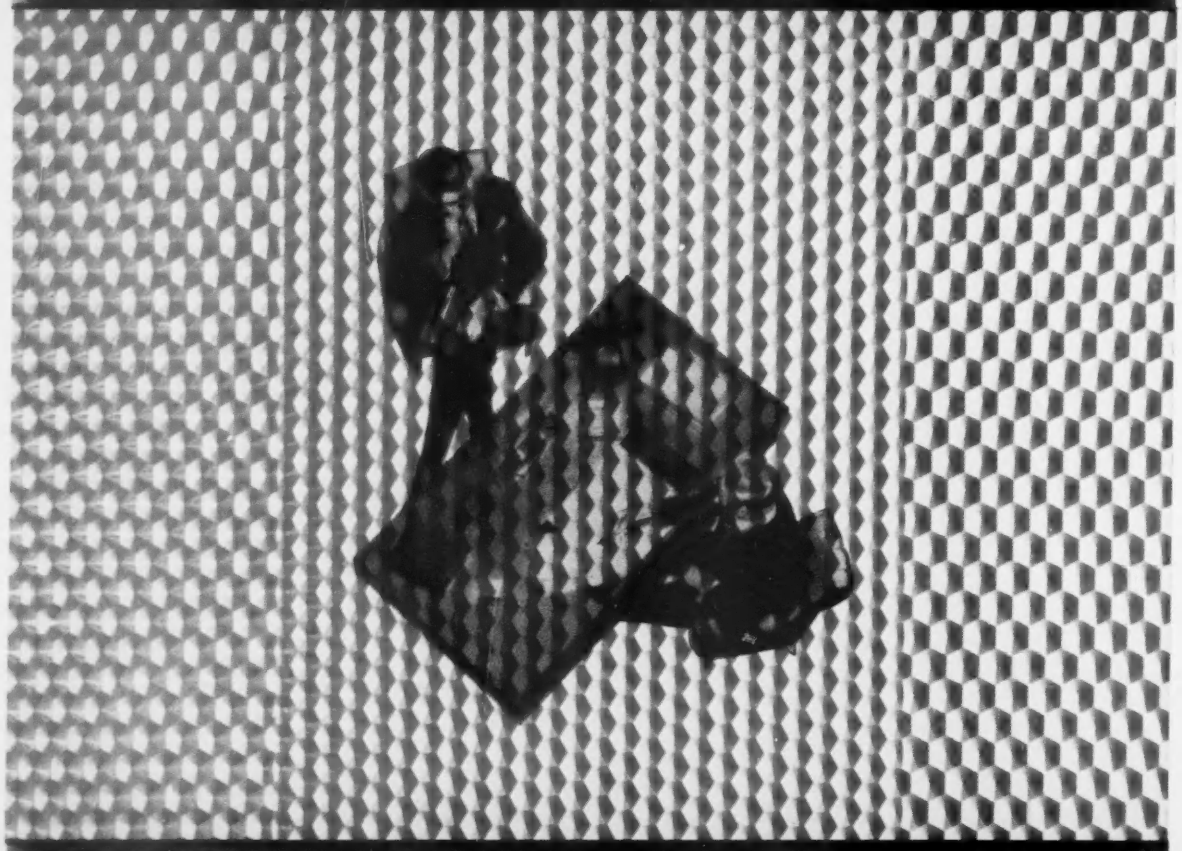

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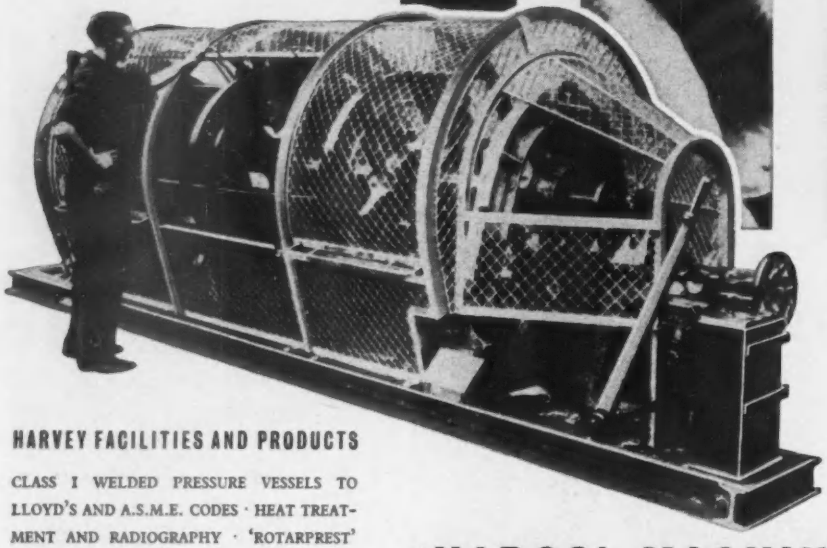

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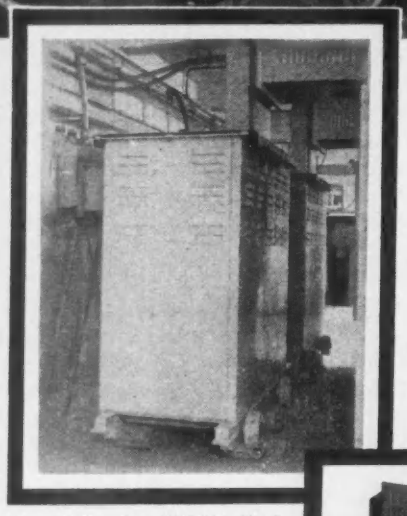

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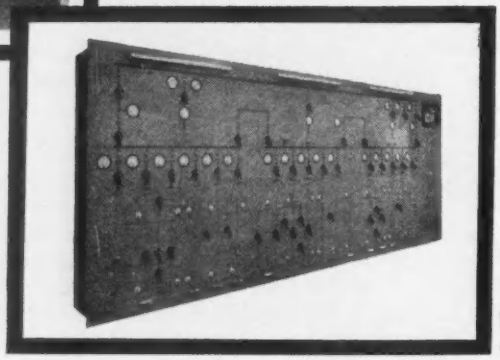

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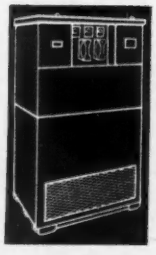

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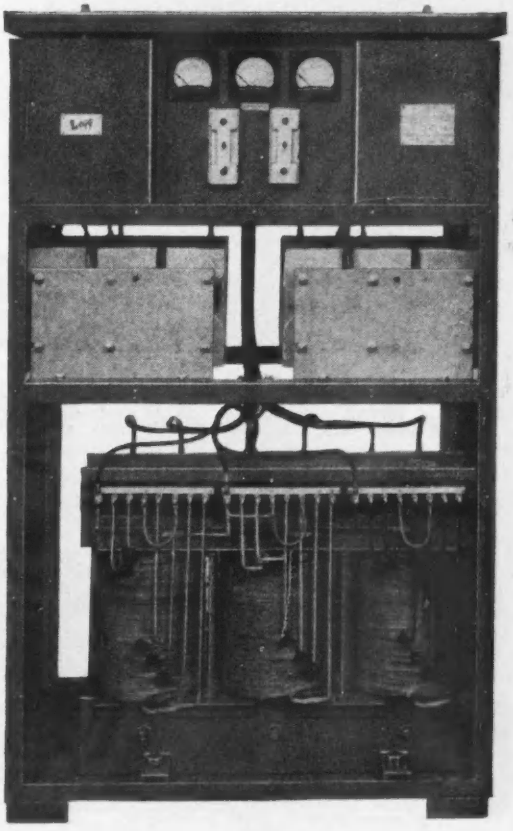

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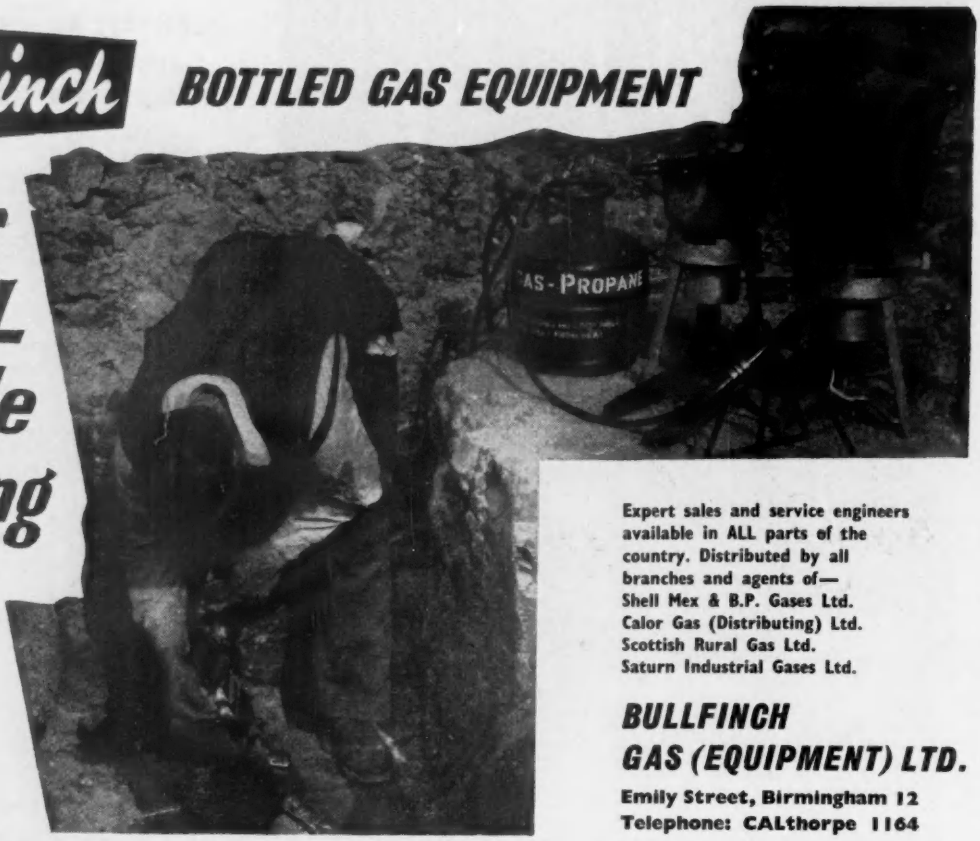

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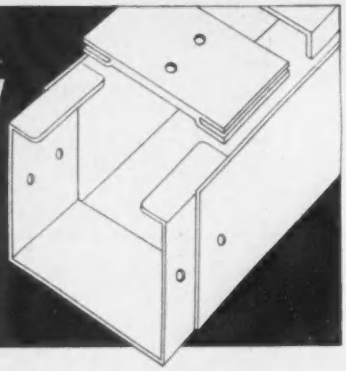

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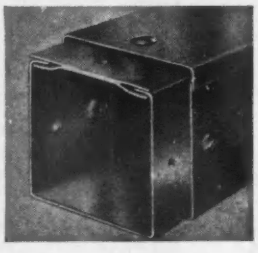

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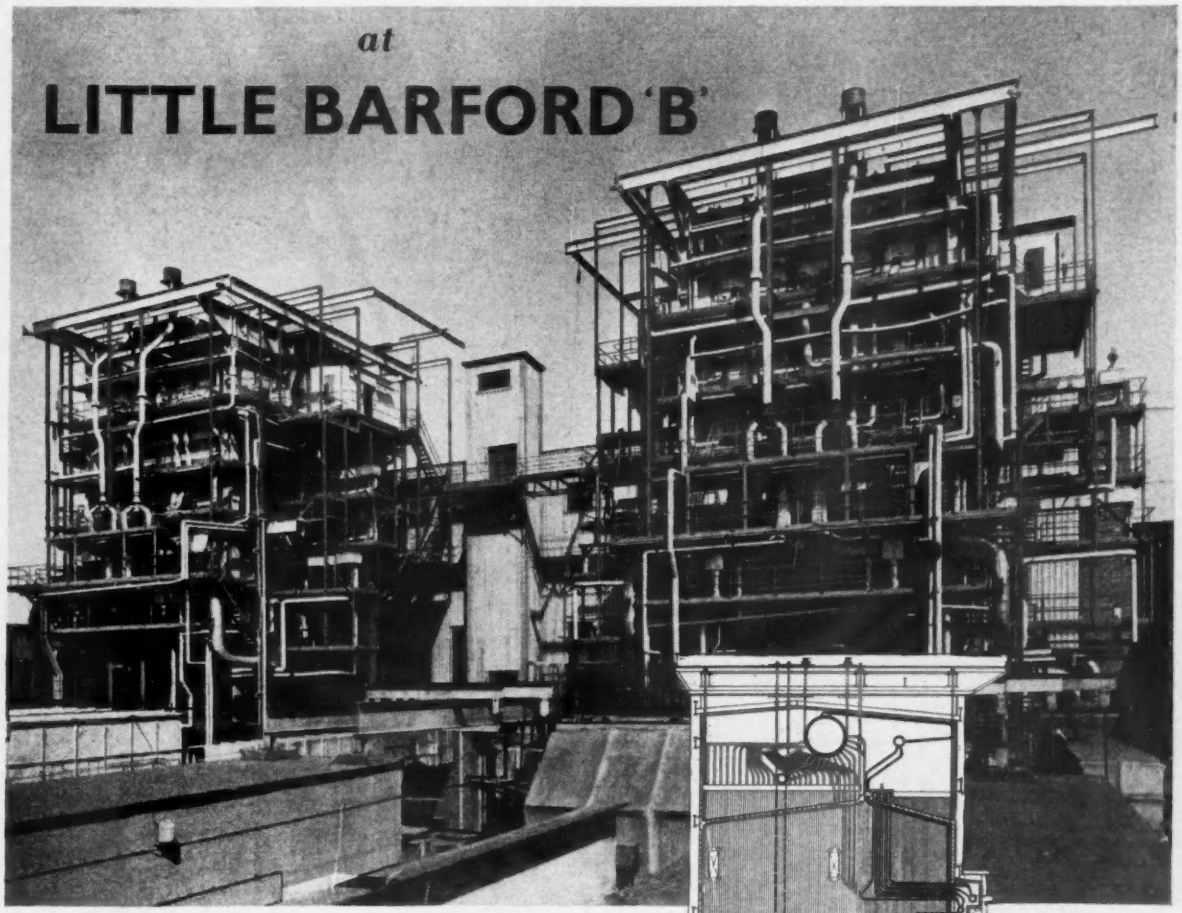

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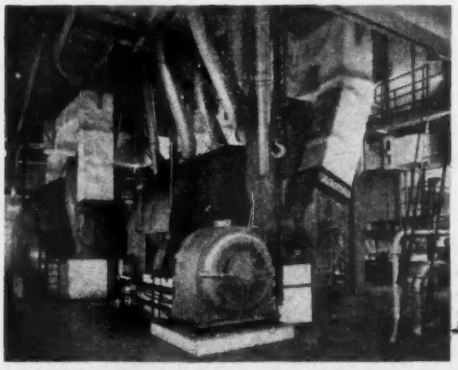

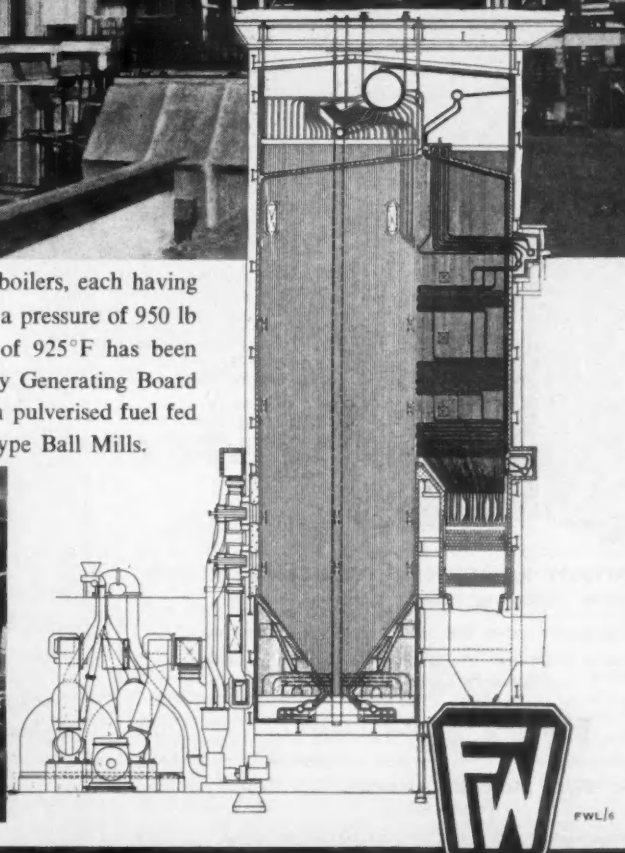

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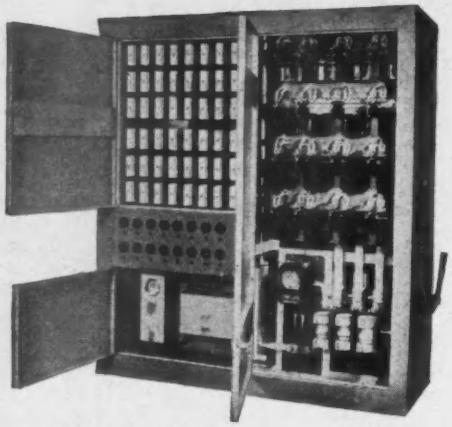

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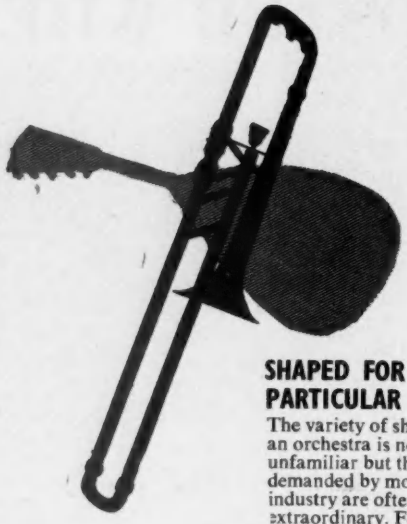

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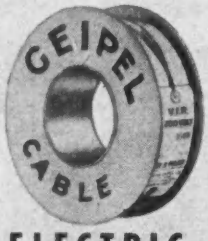

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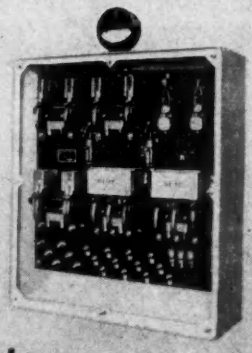

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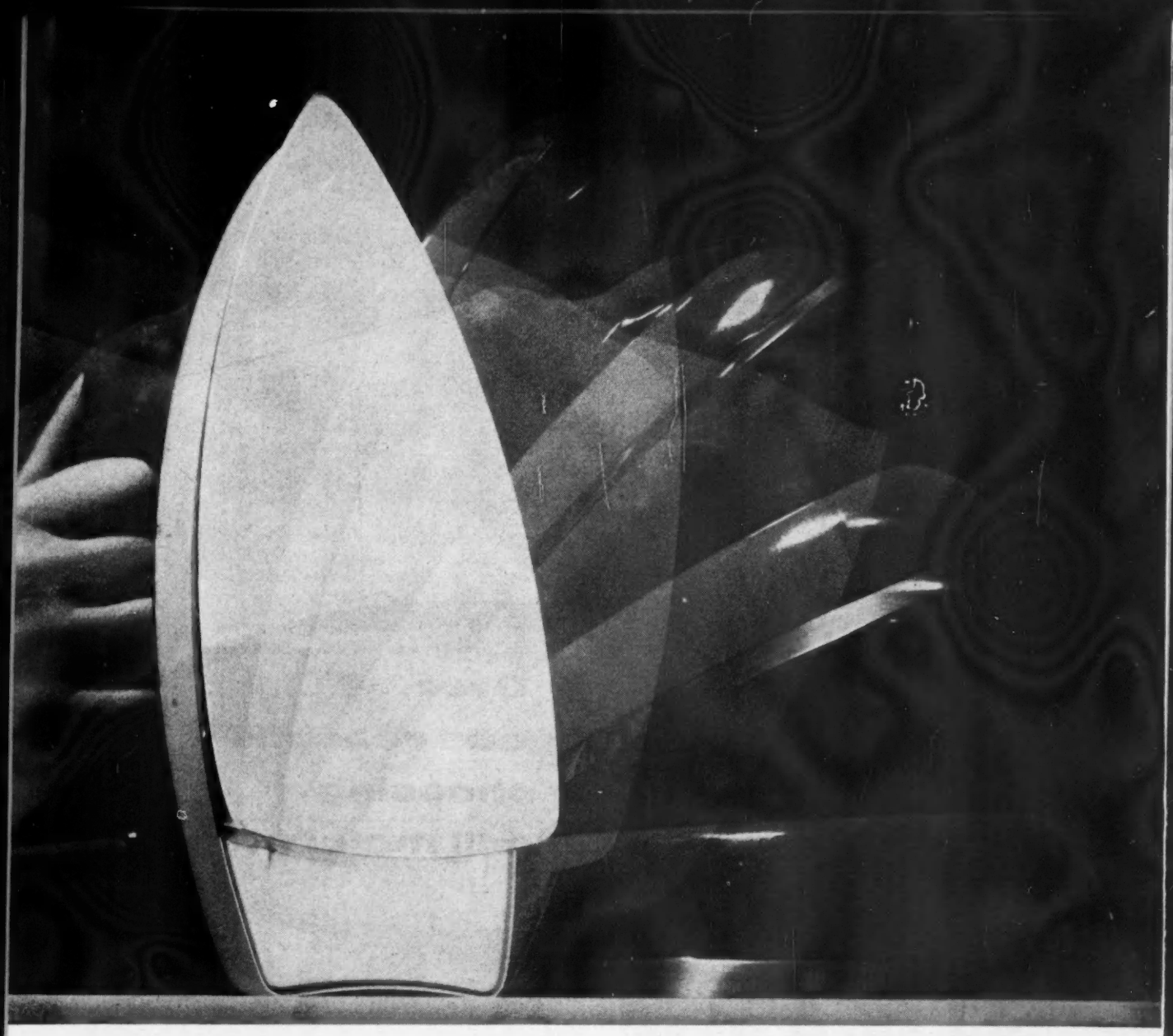

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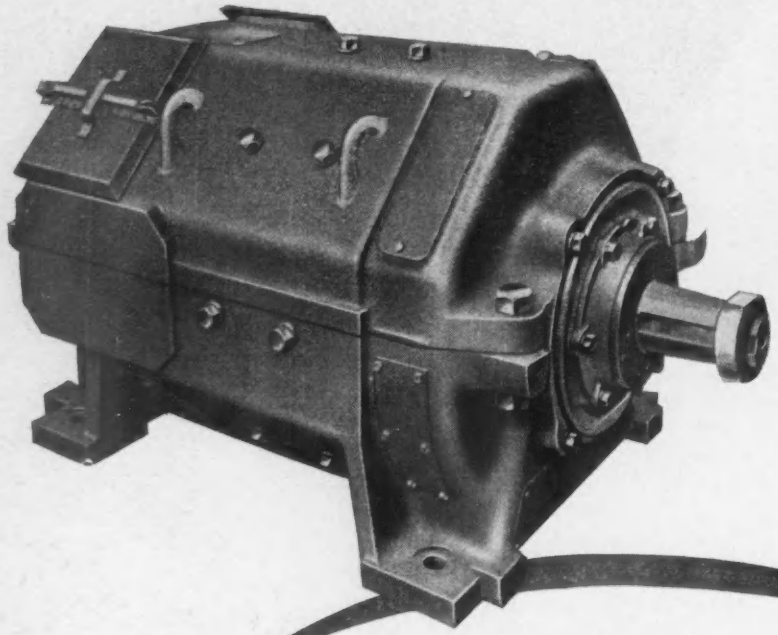

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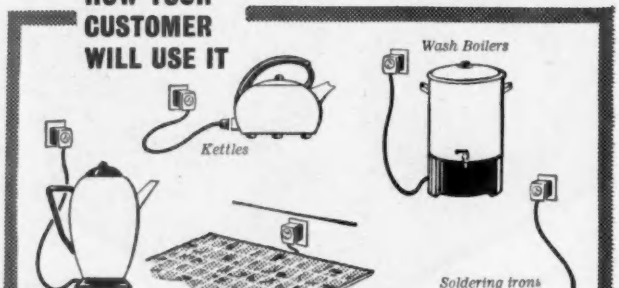
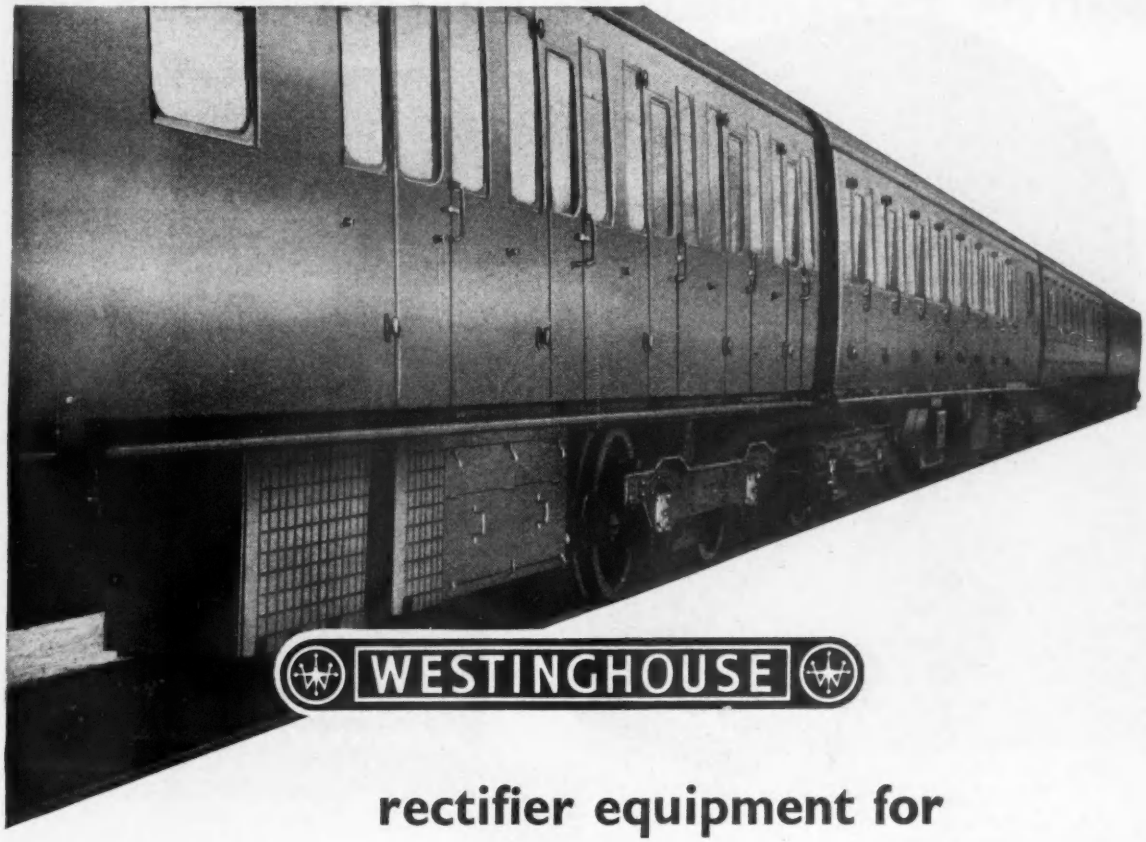


The Sunvic "Reguplug" is a product of:

AEI

Instrumentation Division
P.O. Box 1 Harlow Essex Harlow 25271
Associated Electrical Industries Limited

9C/93A



rectifier equipment for a.c. multiple unit rolling stock

British Railways, Eastern Region

The Westinghouse traction rectifier type 1285 is a completely static equipment employing natural air-cooling, designed for the British Transport Commission for under-frame mounting on the new a.c. multiple-unit rolling stock designed for operating on Colchester-Clacton-Walton; London-Tilbury-Southend and Enfield-Chingford-Bishop's Stortford services. The equipment incorporates two circuits which use specially developed selenium rectifiers of potted construction to meet adverse environmental conditions. Both circuits are supplied from the tertiary of the main transformer which is nominally 240 volts, 50 c/s, single-phase, with a range of variation from 176 to 315 volts. One circuit is a straightforward bridge rectifier giving 200 volts d.c. (nominal) for the d.c. motor of the Westinghouse air brake compressor, the other is a constant potential transductor regulated rectifier providing 8kW at 110 volts d.c. $\pm$1 per cent despite simultaneous load and supply variations, to float charge a 72 cell 55 AHC Nife battery, and supply carriage lighting control circuits, etc.

For details of Westinghouse Rectifiers for special applications, write to Dept.E.T.16 Rectifier Division, Special Products Section.

WESTINGHOUSE BRAKE AND SIGNAL CO. LTD · 82 YORK WAY · KINGS CROSS · LONDON N.1

TERminus 6432

Capstan and Automatic Work and Sheet Metal Pressings in any Metal, any Finish, any Quantity.

GRIFFITHS, GILBART, LLOYD, AND COMPANY LIMITED
EMPIRE WORKS,
PARK ROAD,
BIRMINGHAM, 18
TELEPHONE NORthern 6221

"Sims 155"
VINYL ACETAL

COVERED WIRES

. . . a product of F.D. SIMS LIMITED

P.O. Box 8 Hazelhurst Works, RAMSBOTTOM, Via Bury, Lancs.
Telephone: Ramsbottom 2213/4/5 *Telegrams:* "SIMS" Ramsbottom
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106 Newlands Park, Sydenham London S.E. 26
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551

CONTROL PANELS and SPARE PARTS for AMERICAN CONTROLS

KEMPSTON ELECTRICAL CO. LTD.
KEMPSTON, BEDFORD. Phone: Kempston 2358

PORCELAINS for the Electrical and Allied Trades

GASKELL & GROCOTT LTD.
Whitehall Works, Porthill, Staffs.
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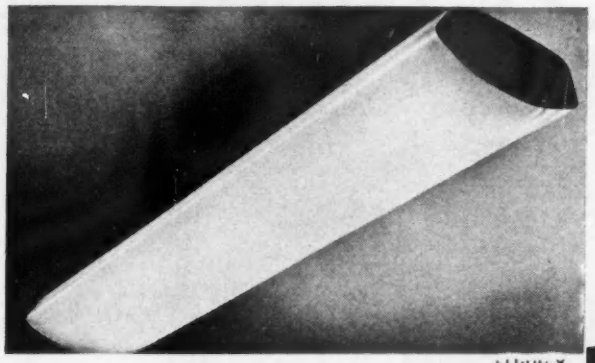
THE COUNTRY RANGE OF FLUORESCENT FITTINGS

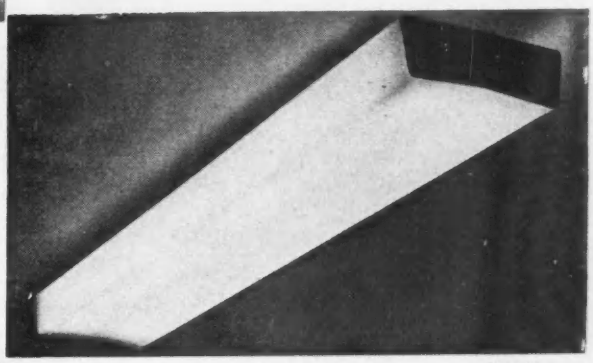


SURREY

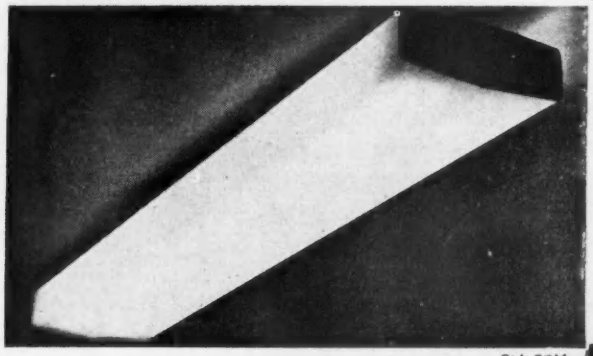
Fittings with clean and functional lines following the modern trend of interior design.

Opal Perspex diffusers with black ends and practically invisible back spines result in high quality fittings reasonably priced.

They are designed as diffusing fittings and not based on an industrial back spine, consequently the lamps and reflectors can be arranged to give maximum efficiency with a wide and shallow diffuser.



ESSEX

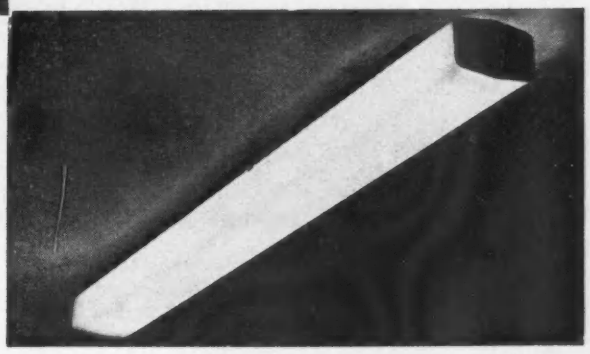


SUSSEX

Ease of maintenance has been an important consideration in the design of these fittings, the diffusers tilting off from either side for cleaning and lamp replacement. Access to control gear is from below.

Only the best materials are used in the production of the fittings including heavy gauge steel, Perspex diffusers and reliable control gear.

COMPLETE INFORMATION ON THESE WELL-DESIGNED FITTINGS IS READILY AVAILABLE ON REQUEST



KENT

Harris & Sheldon ELECTRICAL **Ltd**

RYDER STREET BIRMINGHAM CENtral 6272 · 46 GT. MARLBOROUGH ST LONDON W1 GERrard 0869

THE HARRIS AND SHELDON GROUP OF COMPANIES · SHOPFITTING · INTERIOR DECORATION · DISPLAY

WHICH WAY WOULD YOU TAKE THE PYLONS?

Down in the valley, the town needs more power. The time's come to bring in a power line from the Grid. That means pylons, right across these fields, and on down into the valley.

There are perhaps a hundred paths the pylons could follow. *One* must be chosen. Not plotted arbitrarily across a map, but thoughtfully, carefully sited, so that pylons and cable strike the best possible balance with the landscape.

The Central Electricity Generating Board are just as concerned about this as they are about bringing in the power. For the nation has charged the Board with a double duty. Not only to maintain an efficient, economical electricity supply, but also to preserve the amenities of the country as they go.

That's why the new line will be planned so that it follows the dark background of a wood here; skirts a village there; crosses skylines in the most inconspicuous way to be found; and eventually reaches the town through its industrial suburbs.

These advertisements are appearing in the farming and country magazines. The Central Electricity Generating Board thank electrical contractors for their co-operation in the past, and know that they will do all they can to preserve the amenities of the countryside.

THE CENTRAL ELECTRICITY GENERATING BOARD CEGB

NEWS SHEET

Packaged h.p. scheme covers appliances plus wiring installation. Morphy-Richards-Awley-Finance introduce scheme for h.p. of any combination of equipment costing more than £15, and wiring work to enable it to be used. (192, 216)

Power station coal had to be switched from rail to road last winter to help keep coal flowing to other industrial consumers, reveals Industrial Coal Consumers' Council. (192, 218)

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Takeover struggle for Morphy-Richards, with EMI offering two 10s shares for three 4s M-R shares. M-R disclose that profits to end of June nearly double previous year, and not less than 25% dividend will be paid (217, 222) . . . another takeover is of the Brighton firm, Ellis and Mort Ltd., acquired by Halsey's Electrical Co. . . Hardwick Industries have taken over contracting department of J. S. Smith Ltd. (217)

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PEOPLE—G. N. Green to be chairman NEEB on retirement of T. M. Ayres at year end, J. D. Nicholson to be deputy chairman . . . A. Signorini appointed general manager Pirelli-General Cables . . . J. Evans is new station super. at Ince . . . G. S. Hones (ex Burco) becomes Ada sales manager . . . Dr W. A. Macfarlane elected president, Institute of Fuel . . . J. E. Yates appointed general sales manager, L.D.C. . . . Miss E. M. Ashburn gets Caroline Haslett "Travelling Exhibition." . . . J. G. Warnock to head new hydro-electric division of English Electric. (208, 210)

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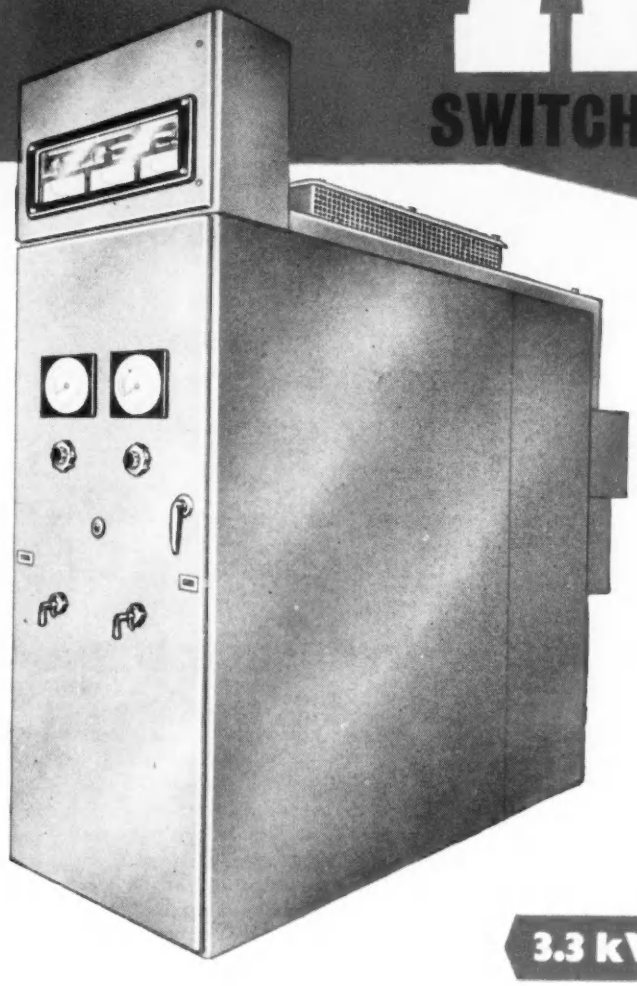
Air Insulated Air Break

TYPE **AH**

SWITCHGEAR UNIT



The Association of Short-Circuit Testing Authorities — ASTA

Certificate of Short Circuit Rating

Crompton Parkinson Ltd. – Short-Circuit Testing Station

3.3 kV. 150 MVA

The newly designed Type "AH" Switchgear Unit is air insulated and embodies an Air Break Circuit Breaker which has been certified for a Rating of 150 MVA at 3.3 KV in accordance with A.S.T.A. Requirements 16 and 18.

WHIPP & BOURNE LTD.

CASTLETON • ROCHDALE • LANCASHIRE

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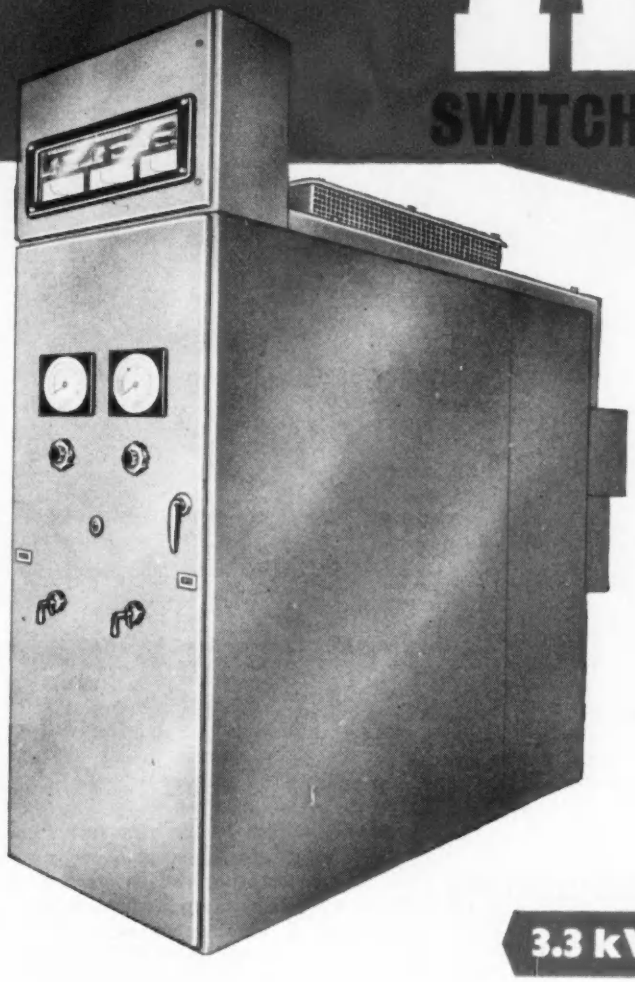

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WHIPP & BOURNE LTD.

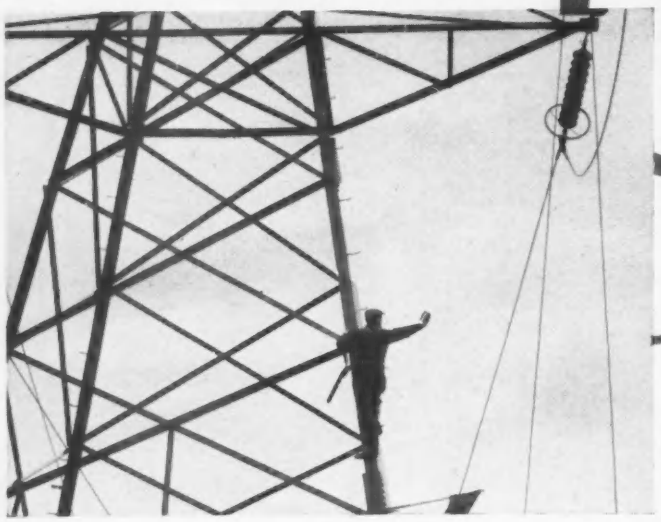
CASTLETON • ROCHDALE • LANCASHIRE

C

Safety first

WITH THE "METRAC"

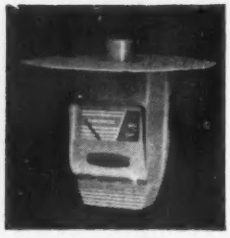
live line indicator



The illustration above shows the "METRAC" in use when checking one circuit of a double circuit 132 kV overhead line prior to earthing. (Photo by courtesy of Central Electricity Generating Board.)

An entirely new approach to an old problem, that of live line detection to satisfy "safe to work" rules. No contact with the conductor is necessary as the "METRAC" detects the electrostatic field set up by a conductor energised by an A.C. voltage. The pointer gives a clear unambiguous indication of danger or safety against an illuminated red and green indicator plate suitably inscribed. Push button operated, small in dimension and weighing less than 2 lb, it is a one-hand instrument.
Available for overhead lines, busbars, conductors and switchgear up to 275 kV.

On the right is shown a model adapted for use at the spouts of draw-out or drop-down metalclad switchgear up to 66 kV. In this the detecting probe is extended and a shield prevents insertion beyond the mouth of the spout.



Manufactured under licence from the Central Electricity Generating Board and accepted by the National Committee for the Approval of Voltage Testing Devices. Is the subject of patent applications both in Great Britain and abroad.

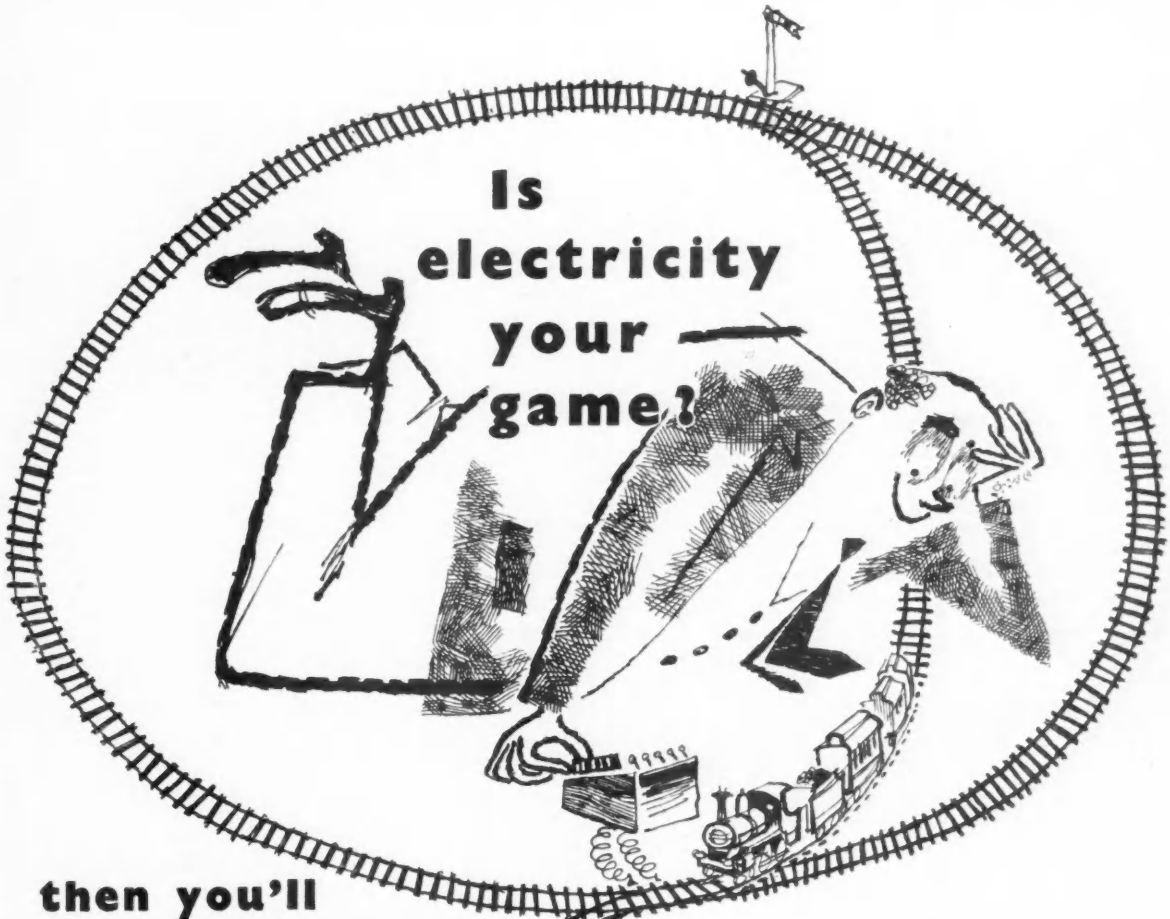
* *This new instrument is fully described in Catalogue Sheet 255B. Please write for your copy.*

EVERETT EDGCUMBE INSTRUMENTS

EVERETT EDGCUMBE & CO. LTD. COLINDEEP LANE, LONDON, N.W.9. Tel: COLINDALE 6045

LONDON OFFICE: Columbia House, Aldwych, W.C.2. BRANCH OFFICES: Birmingham · Cardiff · Glasgow Manchester . Newcastle · Sheffield

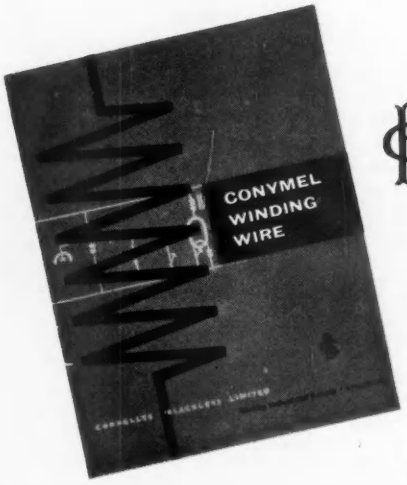
DHB 8120



then you'll be interested in

CONYMEL WINDING WIRE

Conymel, an all purpose vinyl acetal base winding wire, has been developed for many applications where toughness of insulation combined with flexibility and resistance to the solvents in impregnating varnishes is essential. Our latest Conymel catalogue gives all possible technical information on this type of wire, and will be of the utmost assistance to Designers and Coilwinders. A copy will gladly be sent free of charge on request.



CW.8

CONNOLLYS (BLACKLEY) LIMITED

Head Office:

KIRKBY INDUSTRIAL ESTATE LIVERPOOL

Telephone : SIMonswood 2730. Telex No. 62-247

Telegrams : SYLLONNOC, LIVERPOOL—Telex

Branch Sales Offices:

SOUTHERN SALES OFFICE AND STORES
23 Starcross Street, London, N.W.1. Telephone EUSton 6122

MIDLAND SALES OFFICE AND STORES
39/44 Watery Lane, Bordesley, Birmingham 9. Tel. VICtoria 4991
Telex No. 33-309

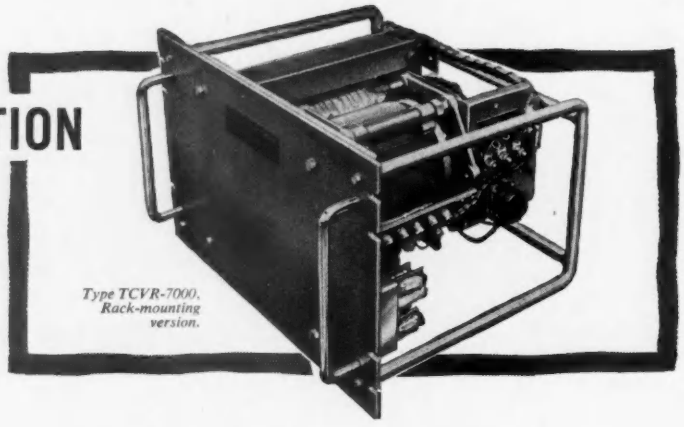
40 VOLTS/SEC AUTOMATIC CORRECTION

—with the type TCVR voltage regulator

The TCVR is a servomechanical automatic voltage regulator having the very high speed of correction of FORTY VOLTS PER SECOND. It provides an *undistorted* output, maintained constant within very close limits (normally ±0.5%) from no-load to full-load, for wide variations in frequency and power factor.

A wide range of models from 1.6 to 12 kVA single-phase, and 4.8 to 36 kVA three-phase, is available, to standard or tropical specification, in cabinets or for rack-mounting. Models are also available in which the output voltage is continuously adjustable over a wide range by means of a panel control. Regulators can be supplied to Services' specification, and special models can be designed to order.

For high-speed, accurate stabilisation *without distortion*—**specify TCVR.**



Type TCVR-7000. Rack-mounting version.

Claude Lyons Ltd.

Other products of Claude Lyons Ltd. Stabiliser Division

BMVR: Motor-driven laboratory and industrial regulators ranging from 1·6 to 29 kVA single-phase, and 4·8 to 87 kVA three-phase. Constancy of output normally ± 0·5% from no-load to full-load. No distortion. Speed of correction 1 Volt/Sec. A great variety of models, standard, tropical and militarised, for all applications.

BAVR: Electronic stabilisers of very high accuracy, and very rapid response, with no moving parts. Input range : − 10% to + 5%, output constancy ± 0.15%. Three sizes : 200, 500 & 1000 VA. Exceptionally useful for control of chemical processes, heating, lighting, etc.

ASR: Automatic step regulators, small, inexpensive, and with sinusoidal output waveform. Two sizes : 1·15 kVA and 2·3 kVA. Input range − 10% to + 5%; output constancy, ±2½%.

ATC: Automatic Tap-Changing Transformers — a development of ASR. Two sizes : 575 VA and 1150 VA. Input range − 20% to + 10% : output constancy, ± 5%. Provide adequate stabilisation for many types of apparatus, at low cost. Also useful as pre-regulators, e.g. in conjunction with BAVR.

We shall be pleased to send you full details of our entire range.

Stabiliser Division **VALLEY WORKS · HODDESDON · HERTS · TELEPHONE HODdesdon 4541-4**

CL/47/E21

Cut CONTROL GEAR ASSEMBLY COSTS with—

BETA TERMINAL BLOCKS

The Beta Terminal Block has been designed for the simple and economical grouping of any number of ways. Extra ways can be inserted without dismantling or further drilling. Only two fixing screws are required for up to 12 ways. Provision is made for numbering each way individually or in groups. Transparent covers are available if required.

Moulded from high grade electrical quality non-tracking phenolic material, with terminals and connecting link made from brass, electro-tinned. While conforming to highest electrical and mechanical standards, the size has been reduced to a minimum.

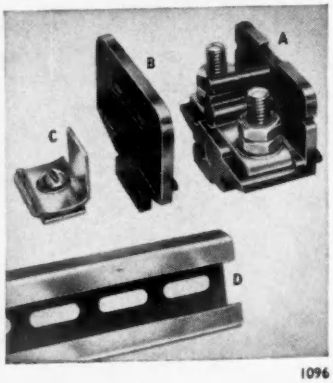
BASIC UNITS

A Body with connecting link and studs.

B Moulded barrier. Required only at one end of group.

C Steel end clamp, one required at each end of group.

D Cadmium plated slotted steel channel.



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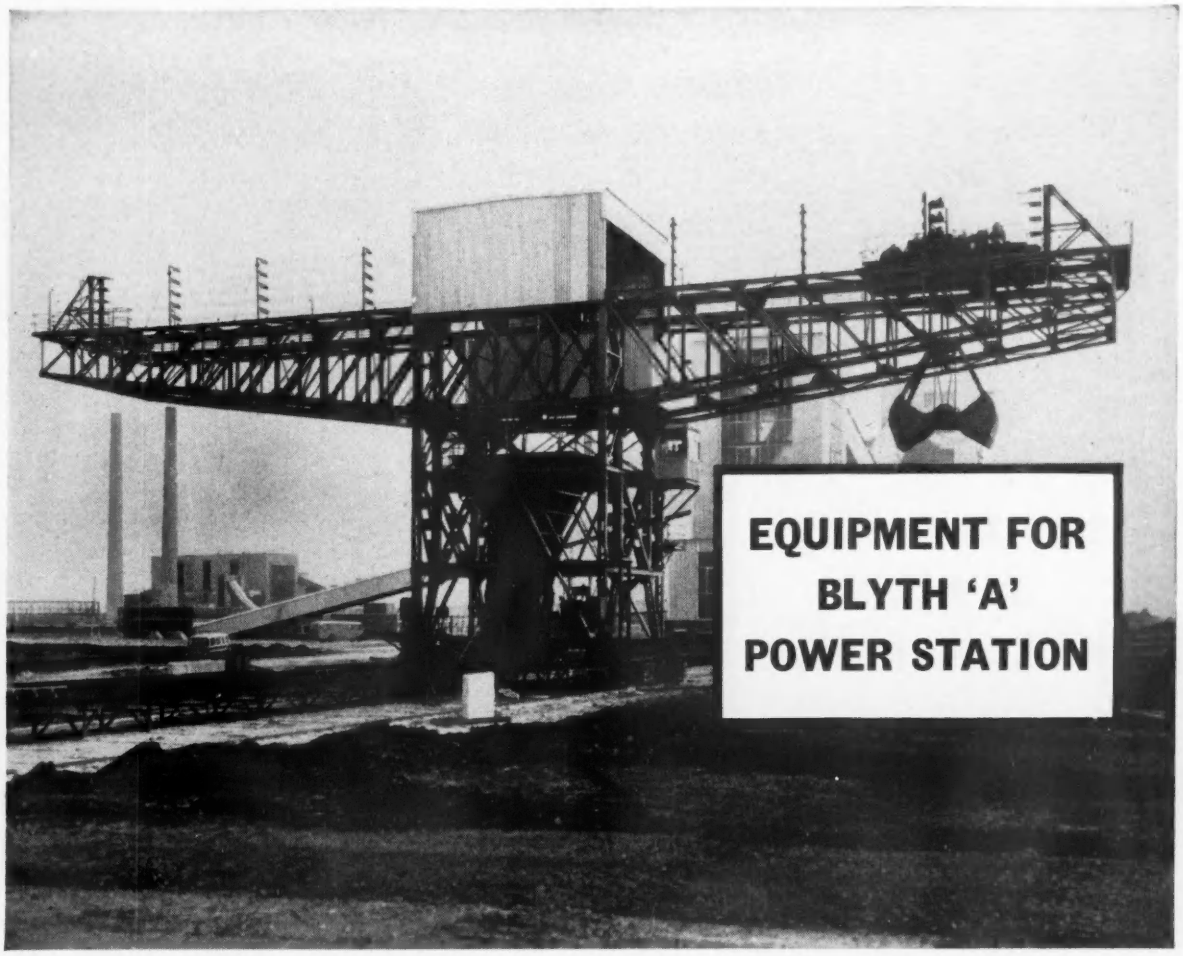

600 tons per hour TRANSPORTER

This large, balanced cantilever, transporter has been installed at the Central Electricity Generating Board's new Blyth 'A' Power Station. The travelling transporter has a capacity of 600 tons per hour and is used for reclaiming coal from stock and delivering on to a reversible belt conveyor.

International Combustion Products Limited are specialists in the design, manufacture, and erection of complete handling equipment for both power and industrial plants.

INTERNATIONAL COMBUSTION PRODUCTS LIMITED

NINETEEN WOBURN PLACE, LONDON WC1. TELEPHONE: TERMINUS 2833
WORKS: DERBY

Member of Atomic Power Constructions Limited—One of the British Nuclear Energy Groups

TGA MH24

'Tis distance lends enchantment to the view,
And robes the mountain in its azure hue.

(Pleasures of Hope by Thomas Campbell)

By courtesy of Tourist Information Centre, Belfast

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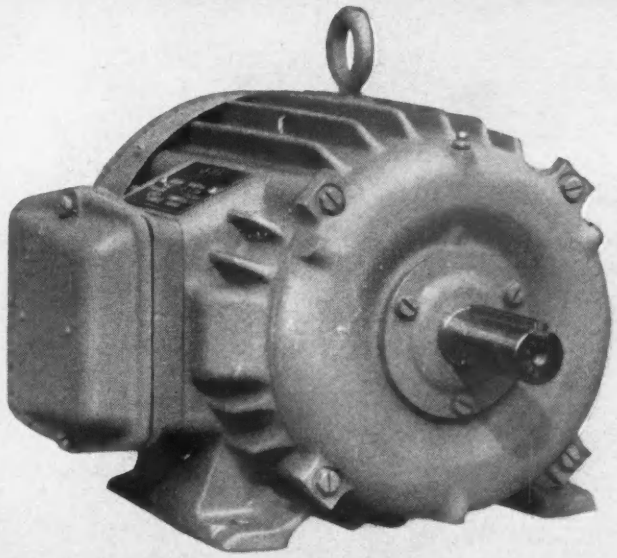

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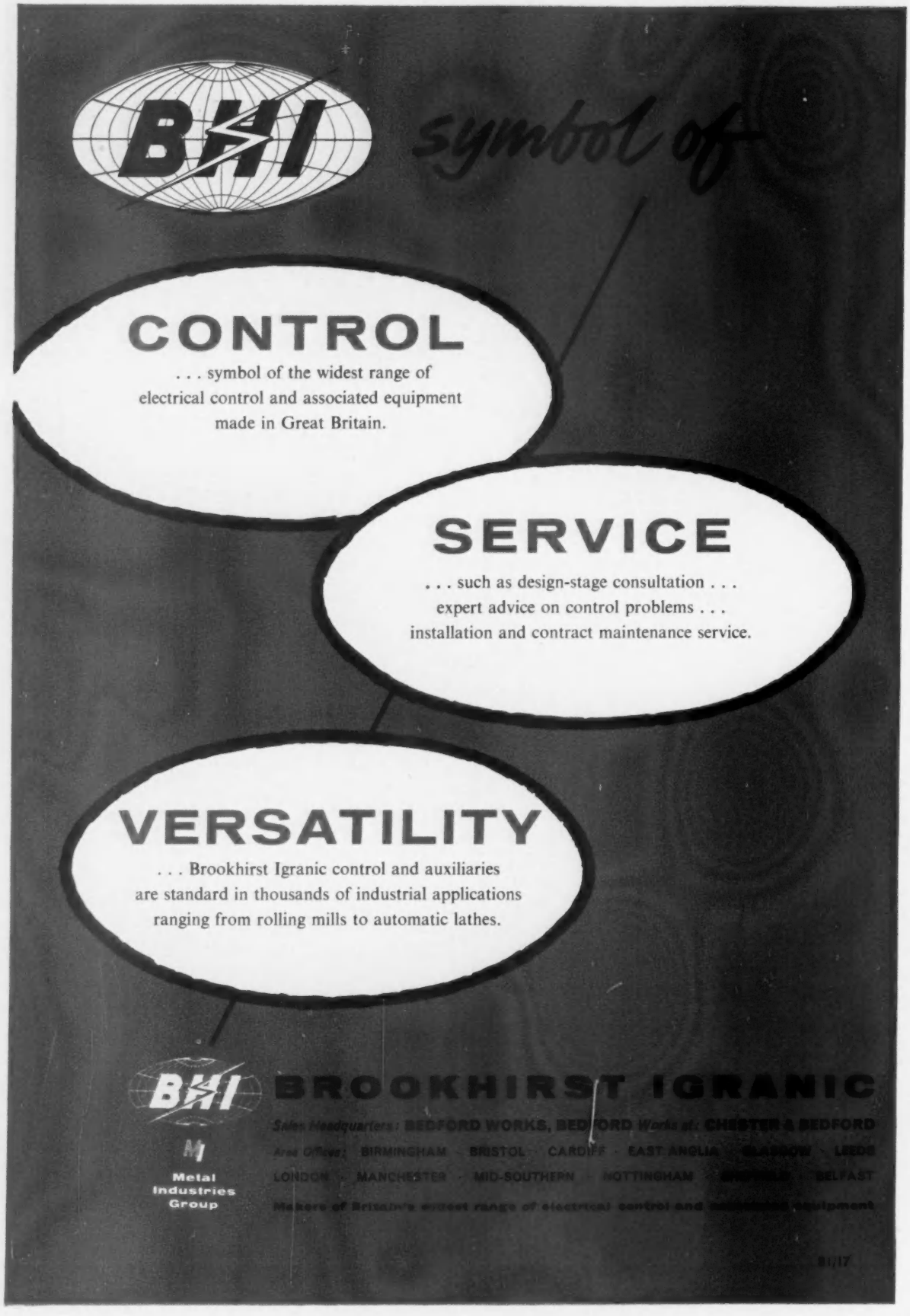
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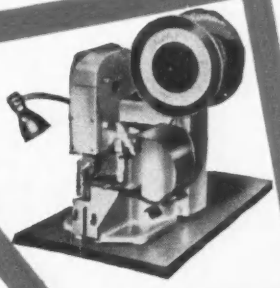

the means . . .

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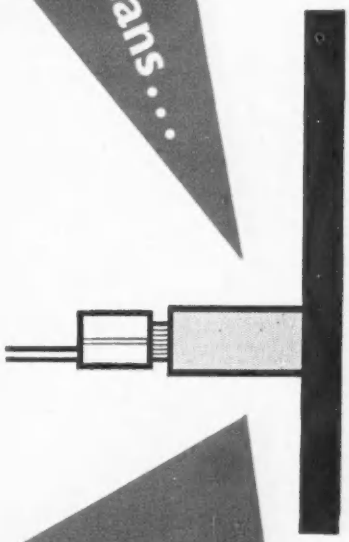

Electrolux Model 62 Cleaner.
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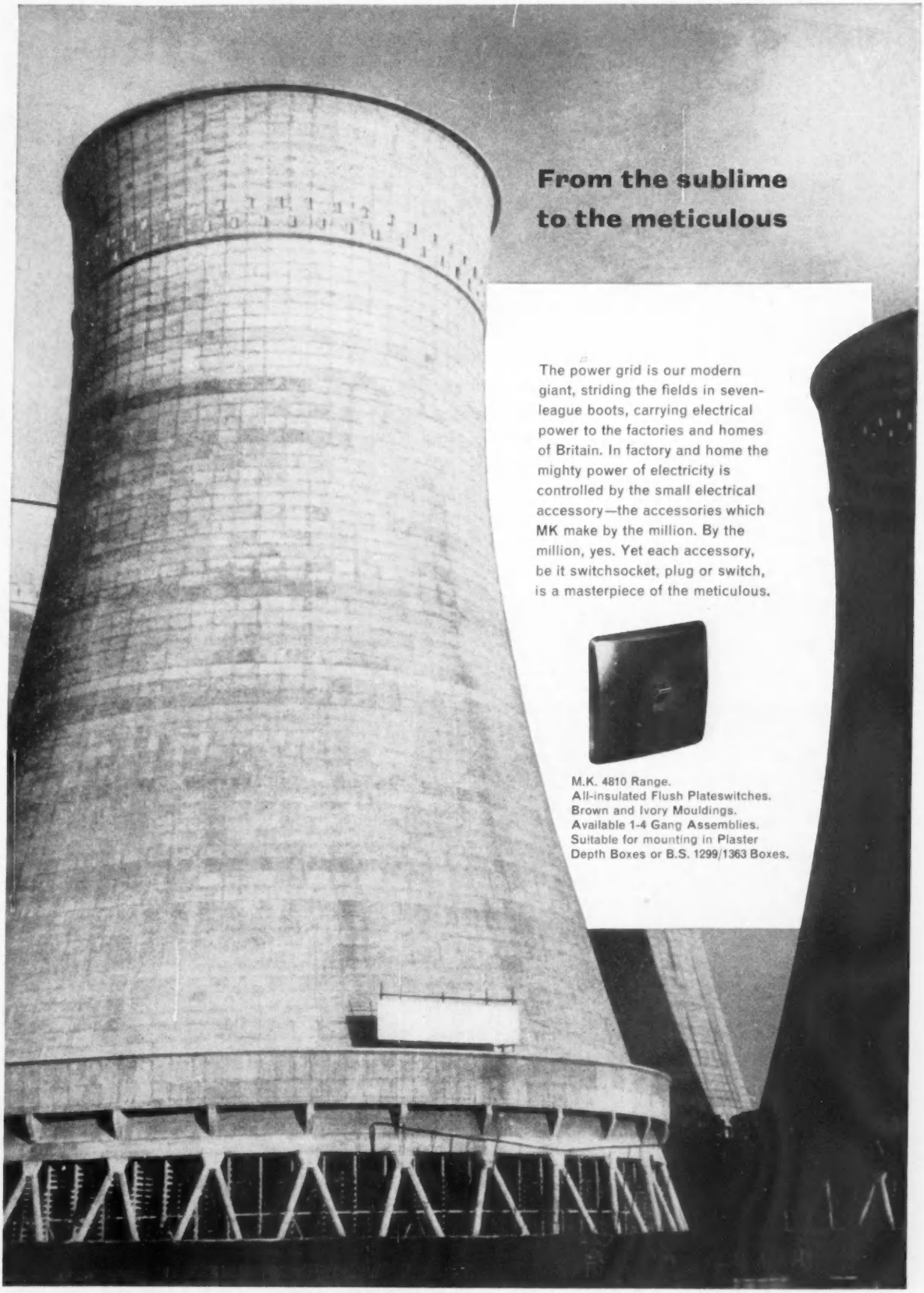

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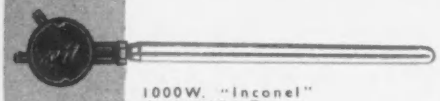

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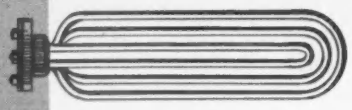

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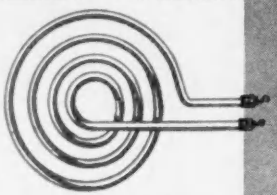

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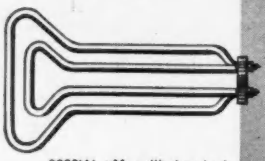

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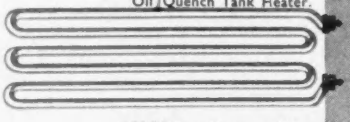

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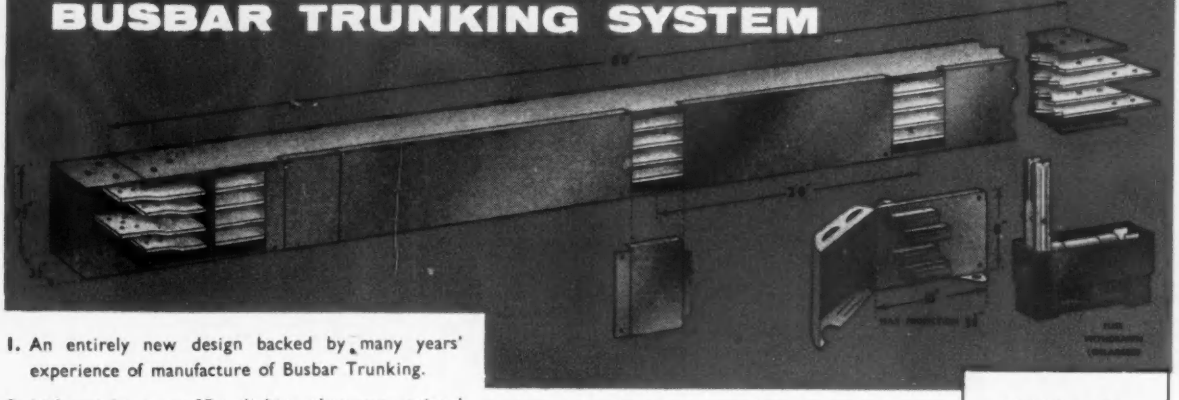

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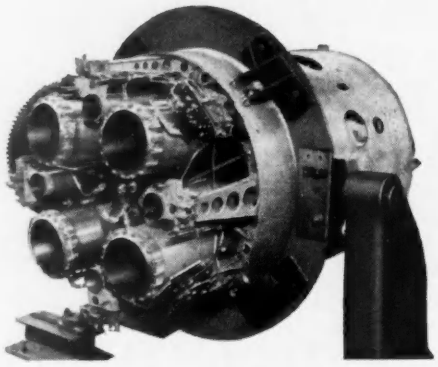
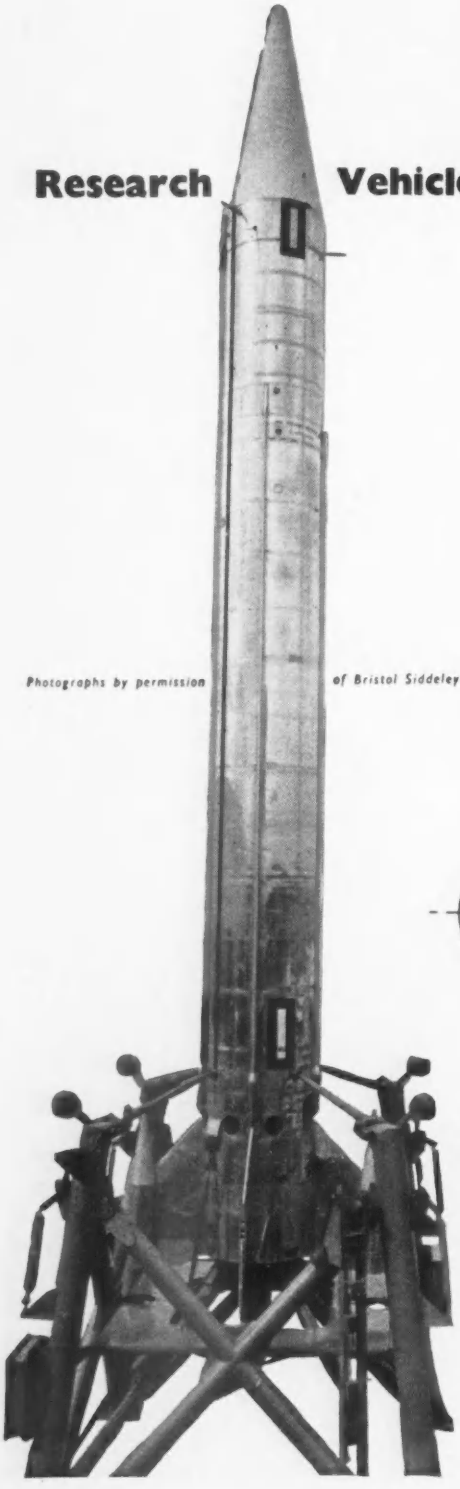


Research Vehicle engines use the Belleville Washer



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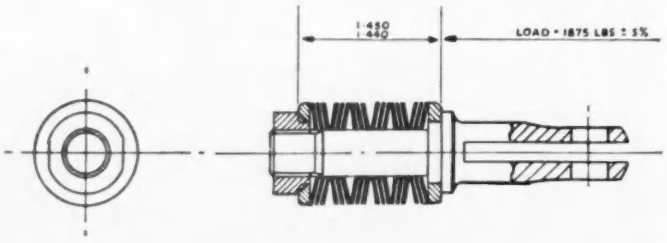

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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
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Dans ce numéro

Méthodes de Distribution sur les Navires 193
Sur les navires équipés d'un circuit à courant alternatif pour alimenter les organes auxiliaires, le système de distribution fonctionne avec le point neutre isolé de la masse. On utilise des disjoncteurs à l'air libre et des fusibles pour protéger le circuit: de forts courants de court-circuit peuvent se produire. On ne recommande pas de sectionner les barres omnibus principales avec des disjoncteurs. On mettra toujours l'accent sur la sécurité dans la conception de ces équipements en général.

Centrale Electrique Géothermique aux Etats-Unis ... 199
La Californie va dans le proche avenir prendre en charge une centrale électrique géothermique de 12,5 MW. La vapeur utilisée est à 7,03 kg/cm² à 176°C, et s'échappe dans un condenseur sous un vide de 10 cm de mercure. Le consommation de vapeur sera de 1090 kg/h. Des éjecteurs de vapeur dans le condenseur extraient les gaz non-condensables, existant dans une proportion de 0,75% en poids. La vapeur est fournie par des puits profonds de 159 à 428 mètres, et la nature corrosive des gaz entraînes exige l'utilisation d'aciers inoxydables dans toute l'installation de vapeur y compris les tours de refroidissement.

Utilisation de la Force des Marées 202
Après quarante ans d'études dans les régions de Passamaquoddy/Cobscook Bay, aux frontières du Canada et des Etats-Unis, il a été déposé un projet d'installation maréemotrice devant la Commission Mixte Internationale. La retenue entre les hautes eaux (259 km²) et les basses eaux (104 km²) permettra d'entrainer trente turbo-générateurs de 10 MW, qui fourniront une puissance annuelle estimée supérieure à 3 000 millions de kWh.

In dieser Nummer

Praktische Hinweise für die Kraftstromverteilung auf Schiffen 193
Bei Schiffen mit Wechselstromanlagen zur Versorgung der Hilfsmaschinen wird die Stromverteilung mit nichtgeerdetem Nullpunkt ausgelegt. Zum Schutze der einzelnen Stromkreise werden Luftausschalter und Sicherungen mit hoher Abschaltleistung verwendet, da mit dem Auftreten hoher Kurzschlussströme gerechnet werden muss. Ein Auflösen der Hauptsammelschienen in Teilstrecken mit dazwischenliegenden Ausschaltern ist nicht zu empfehlen. Im Allgemeinen soll beim Konstruieren elektrischer Ausrüstungen dieser Art das Hauptaugenmerk stets auf Sicherreit gerichtet sein.

Erdkalorisches Kraftwerk in den USA 199
Ein für eine Gesamtnennleistung von 12,5 MW ausgelegtes erdkalorisches Kraftwerk wird demnächst im Staate Kalifornien, USA, in Betrieb genommen. Der Betriebsdampfdruck beträgt 7,03 kg/cm² bei 176°C; der Abdampf wird einem Kondensator mit einem Unterdruck von 100 mm Hg-Säule zugeführt. Es wird mit einem Dampfverbrauch von 1 090 kg/h gerechnet. Diese Berechnung nimmt Rücksicht darauf, das der Kondensator mit Dampfstrahlpumpen aus gestattet wird, die zur Ausscheidung nichtkondensierbarer Gase dienen, die schätzungsweise etwa 0,75% vom Dampfgewicht ausmachen. Der Naturdampf kommt aus einer Tiefe von 159 bis 428 m. Die korrodierende Wirkung mitgerissener Gase bedingte die Verwendung rostfreien Stahls für sämtliche dampfführende Taile der Anlage, einschliesslich der Kühltürme.

Gezeitenkraftwerk 202
Nach 40-jährigem Studium der Verhältnisse im Raum von Passamaquoddy und der Cobscook Bucht an der Grenze zwischen den Ver. Staaten und Kanada ist nunmehr der International Joint Commission (internationalen gemischten Untersichungsausschuss) ein Projekt zum Bau eines mit Hochund Tiefbecken geplanten Gezeitenkraftwerkszur Genehmigung vorgelegt worden. Der Ueberlauf vom 259 Quadratkilometer umfassenden Hochbecken in das Tiefbecken mit einer Fläche von 104 Quadratkilometern wird dreissig Turbogeneratoren von je 10 MW antrieben. Die Gesamtleistung der Anlage wird auf mehr als 3 000 Millionen kWh geschätzt.

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 11 AUGUST, 1960

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K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

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Comment

CENTRAL HEATING FOR HOUSES

The guide to central heating methods and costs that the Institution of Heating and Ventilating Engineers has prepared for the non-technical householder is sure of a widespread welcome. An increasing number of people are thinking of whole-house heating as a worth-while claim on their spare cash, and this guide gives them figures to think on. The publication is a good example of the way a professional institution can help its members by providing authoritative background information on a problem to ease the approach of client to chosen advisers. Moreover, as would be expected from the IHVE, a conscientious effort has been made to hold the ring fairly between the various fuels that are possible. Although many with experience of electrical floor-warming may consider the cost figures shown to be above what that technique involves, there is none of the extreme anti-electrical exaggeration that is sometimes met. The problem with which the guide confronts the electrical industry is on a different plane. Quite openly, the costs and descriptions offered deal only with central heating as it is commonly understood, with the implication of a single, integrated installation. The flexibility of electricity, with its possibility of combining several types of individual appliances with or without floor-warming to give whole-house comfort, is thus rendered of little account. The only effective answer would seem to be for the electrical industry to produce its own agreed guide, showing how whole-house heating is possible in a variety of ways by electrical methods—and to tell the interested inquirer where the necessary guidance is to be found on how to go about such a project. The need for such a guide has been argued often enough in these columns. The present instance provides a fresh case for EDA-manufacturer co-operation if a trick is not to be yielded to the opposition in the fight for house-heating custom.

. . . AND FLATS

A different attitude to electric floor-warming is seen in a preliminary Building Research Station report on studies of flats with various heating systems. Electric floor-warming systems were found to run at a lower temperature in average winter weather, and to use markedly less energy over the year as a whole. The Station is constrained to comment that the results demonstrate once again that comparisons of domestic heating systems cannot be made simply in terms of cost per unit of heat alone. Control and metering comes into it; that is one way in which electrical methods gain. Moreover, the Building Research Station investigations found the general attitude of tenants towards floor-warming quite as favourable as that

towards other forms of central heating, for they were often more comfortable than with hot-water radiators, especially when they had supplementary use of electric fires.

PACKAGE-DEAL H.P.

Morphy-Richards claim the attention of electrical retailers this week for reasons more than their take-over problems. They are launching, in conjunction with Awley Finance, an h.p. scheme with two novel features. First, it is specifically designed to cover groups of small appliances—though larger units are in no way excluded—and secondly, it plans to provide cash to cover wiring installation as well as appliance purchase. The first of these elements is less original than the promoters claim, and its effectiveness is likely to be offset by the minimum of £15 expenditure before the h.p. facilities are being made available. Although a three guinea iron may be included in the deal, it cannot normally stand alone. The idea of covering the extra socket-outlet that may be necessary to make it possible to use the equipment purchased is another matter. Any enterprise the industry shows in encouraging enhanced installation adequacy is sure of a potentially sympathetic reception. The immediate scheme, however, must be subject to some reservations. The amount of installation work accepted as a charge will be tied closely to the appliances purchased, for the scheme has the intention of selling appliances, not wiring. Although it is to be left to the retailer to decide what wiring is appropriate there will inevitably be a trend to minimum wiring, which is against the interests of the industry in many ways. In most cases, it will prove to be against the long-term benefit of the customer as well. It may be that in its installation aspect of the scheme the alert retailer, especially when he operates a contracting business as well, will regard the wiring element of the h.p. scheme only as good bait to get the prospect interested.

POWER STATION COAL

The supply industry, the NCB's largest customer, seldom figures much in the dull annual reports of the Industrial Coal Consumers' Council. This year, however, it holds star position, with two commendations. It seems that the CEGB's late-1958 agreement with the railways, that they should carry more of its coal at the expense of road transport, did not work out as fully as might have been hoped. In fact, last winter there had to be an emergency switch back to road supply for the power stations, because otherwise railway operating difficulties would have stopped the coal—of which there was so much in stock—from reaching other waiting industrial consumers. The CEGB helps as well by stocking coal at an even rate throughout the summer as well as the winter, and at the present time of high summer it is carrying as much as five weeks' stock of coal at winter consumption rates (it was carrying six weeks' stock at the same time last year). The Consumers' Council contrasts this willingness to help out the NCB—and railways, it seems—with the attitude of most industrial consumers who want their coal delivered when they need it. Some incentive by way of lower prices for industrial summer stocking-up on the lines of the domestic coal market, is seen as justified.

SHIPBOARD SHORT-CIRCUIT

Short-circuit levels in ships are a matter of growing concern as the amount of electrically-powered auxiliary equipment extends, demanding more and more generator capacity feeding into a closely-linked distribution system. The usual techniques for dealing with this sort of situation, such as sectionalising, are less applicable on shipboard than in most land installations, because of the need to retain maximum flexibility in the system on which the life of the ship depends. Already the levels of short-circuit rating for air-break circuit-breakers for which there are BS specifications at medium voltage are being approached, and exceeded in some cases, at least at the main switchboards of ships. Fuses provide some palliative for the situation, since they are manufactured in standard interrupting ratings higher than circuit-breakers, but they also involve some loss of flexibility. As this week's article in the series on marine a.c. systems shows, ingenuity in design can keep the situation fairly satisfactory with present fault levels, but if the amount of auxiliary power being built into passenger ships increases much, it seems that a move to a higher voltage will soon become relatively urgent.

FEET FIRST

Floor-warming has had many criticisms to contend with, and experience has convinced those who have struggled to sell this form of electrical heating, that the correction never catches up with the original criticism. So there is likely to be concern that a short article in a small monthly journal, *Chiropody Review*, should have attracted the attention of the daily papers. Its allegations are simple; that floor-warming is bad for the feet because, to quote the author's flight of fancy, it involves having "the feet in a continual hot bath of air." No case histories are quoted to back up this statement; this is going to be one of those difficult situations where the electrical industry can only quote negative evidence. Yet the evidence is quite extensive, and includes testimony from outside the industry, that those who have worked for long periods in floor-warmed buildings do not suffer from foot troubles; and conversely, that with surface temperatures restricted in British practice to below 80°F, no troubles are to be expected. This information should now be spread widely and kept in mind for the future, for the allegation about foot discomfort is likely to make repeated appearances now it has been launched.

Meteor

This week's quick summary of electrical news faces advertisement page 16

Distribution practice in alternating current ships

by M. J. Bolton,* A.C.T. (L'pool), A.M.I.E.E., A.I.Mar.E.

FOR over 30 years it has been usual, under the provisions of the Electricity Supply Act 1926, for new electrical distribution systems ashore to distribute alternating current, and the use of direct current has been restricted to a few special industrial drives. Over the same period of time, ships' electrical systems have, for reasons explained in earlier articles, operated predominantly on d.c. and it is only recently that there has been a marked change to the use of a.c.

In many respects, electrical distribution systems ashore and afloat are similar, but there are some essential differences. For example, the loss of power to an industrial drive may sometimes be serious, but it is rarely dangerous. On board ship, the sudden failure of a steering motor or engine-room auxiliary can place the vessel in considerable danger. In industry, repair or replacement of faulty equipment creates few serious problems for works' engineers, who can, if necessary, call upon external resources for expert advice and practical help. Ships' engineers, on the other hand, are expected to deal with all forms of electrical failure quickly and without external assistance. The ship's electrical system must, therefore, be as simple and as reliable as possible, consistent with safety.

The Distribution System

It is common practice in industry to earth the neutral of a medium-voltage distribution system. The voltage to earth is then limited to the phase-to-neutral voltage of the transformer or alternator supplying the network, and there is the choice of both phase-to-phase and phase-to-neutral voltages for distribution. These two advantages still apply to marine systems, which operate at broadly similar voltages and frequencies, but other factors are of greater importance to the marine engineer.

In industry, when an earth fault occurs, a circuit is completed via the neutral earthing connection and a fault current flows to blow a fuse or trip a circuit-breaker. The faulty circuit is thus automatically isolated from the rest of the network. The desirability of such rapid isolation of earth faults in ships is questionable, because many of the circuits are essential to safe navigation.

Normal marine practice of leaving the neutral point unearthed avoids this hazard. A state of low insulation resistance to earth on one phase does not then result in automatic tripping, and essential services can continue to operate until "standby" plant can be started up to replace them. Earth-leakage indication lamps or instruments are provided to indicate the state of the system insulation at all times.

Of prior importance, particularly where ships carrying inflammable cargoes are concerned, is the fact that with an unearthed system the danger from heavy fault currents circulating in the structure of the ship is almost eliminated. In oil tankers unearthed systems are mandatory.

A further point in favour of the unearthed system is the absence of earth-fault protection, thereby keeping the installation simple. It is, of course, very necessary to clear a fault to earth as soon as possible, otherwise a second earth fault on another phase may combine with it to produce a phase-to-phase fault and this will result in loss of supply.

Protection of Feeder Circuits

Protection is provided for all feeder circuits against overcurrents which fall into two categories:

1. *Overload Current.* A healthy circuit condition in which the cause of the overcurrent is external to the circuit.

2. *Fault Current.* An unhealthy circuit condition caused by a failure of insulation between phases or, in an earthed system, between one or more phases and earth.

The overload condition is easily appreciated. In motor circuits, for example, currents up to eight times normal

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*Mr Bolton is with the English Electric Co. Ltd. This article is based on two lectures given at the Royal Technical College, Glasgow, in a series on alternating current for marine auxiliaries.

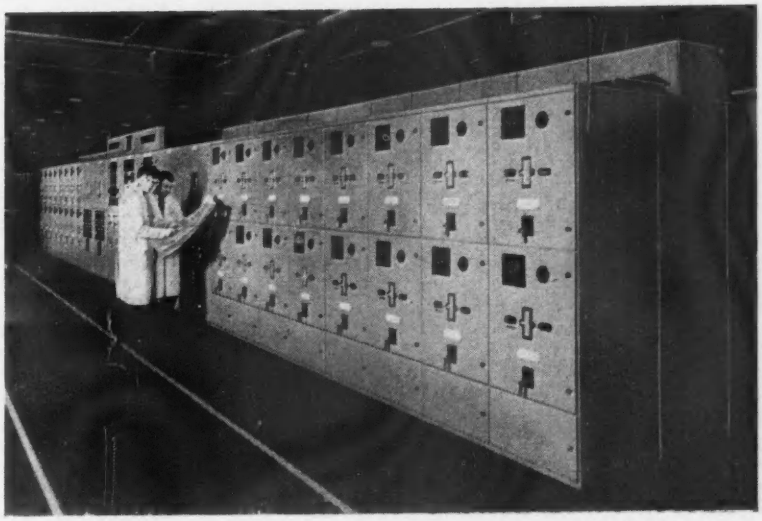


Fig. 1. The 440 volt d.c. main switchboard built by English Electric for the P. & O. liner s.s. "Canberra" receiving a final check before dispatch from the works

load current may flow, but not more, since the stalled-rotor impedance of the machine fixes a definite maximum current.

A fault current condition is very different. The circuit impedance is again a dominating factor, but since it may be very low in value, the size of the power source becomes of great importance. Thus there is a great difference between a short-circuit fault in a ship with low generating capacity and a similar fault at the same working voltage in a large installation.

In addition to their primary duties of control and interruption of overcurrents, protective devices must also fulfil the basic requirements of reliability, safety and simplicity. Before they can be fully specified, then, the needs of the various types of circuit must be examined.

All feeder circuits comprise the cable carrying the supply current and the apparatus receiving the supply, whether it is a simple lamp, a motor starter or a switchboard.

If the apparatus is a simple lamp, or group of lamps, it cannot be given overload protection, because on a fixed voltage system lamps cannot be overloaded. Protection is only required to safeguard the cable against fault currents.

If a motor starter is considered, overload protection for the machine is invariably provided within the starter. Again, therefore, protection is only required for the connecting cable against fault currents.

The case of a subsidiary switchboard or distribution board is similar. The sub-circuits are individually protected and it is only the connecting cable and, perhaps, the busbars of the switchboard or distribution board which require fault current protection.

For many years the most common form of protection for all types of cable has been the h.r.c. cartridge fuse. Operating experience has proved long ago the adequacy of this simple device for this purpose, and it is probably true to say that more h.r.c. fuses are used for protecting cables than any other apparatus.

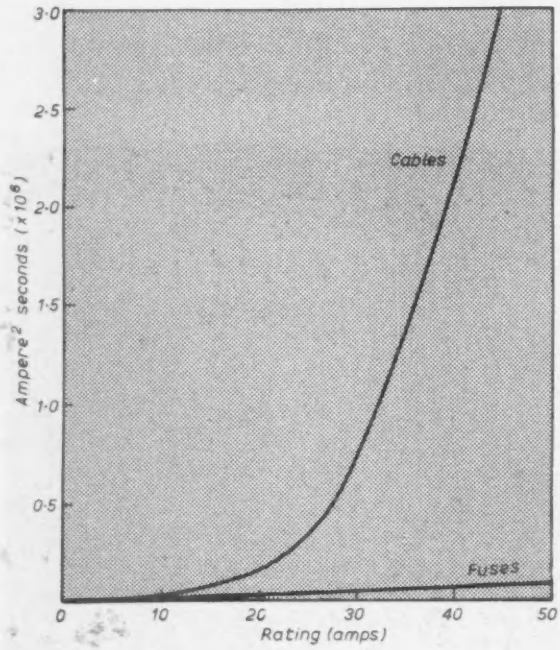


Fig. 2. Thermal protection of cables under short-circuit conditions

H.R.C. Fuses

The leading designs of h.r.c. fuse possess unique properties, among which are high-rupturing capacity, non-deterioration under working conditions, high speed of operation and low cost compared with other forms of short-circuit protection. In recent years such fuses have been calibrated in terms of the maximum quantity of energy they will allow to pass before blowing. Likewise, some cable makers have allocated to their cables ratings in terms of the maximum quantity of energy that they will sustain without deterioration. By correlation of these two, it has been established that, provided the fuse has been correctly designed and manufactured, short-circuit protection can be given to a cable by a fuse of considerably higher current rating. The units employed are ampere-squared second units (I^2t) and they are derived from test oscillograms. Their use in connection with fuse discrimination was the subject of a recent IEE paper.*

Fig. 2 shows rubber-insulated cable ratings plotted against the number of I^2t units of energy the cables will withstand without damage. Also shown is a similar curve plotted for a range of h.r.c. fuses on a basis of I^2t energy units let through under short-circuit conditions. It will be noted that for every rating of cable there is a fuse of the same rating, or indeed considerably greater rating, which will protect it.

The practice of protecting cables with h.r.c. fuses is not, of course, new and an empirical rule that the fuse rating shall not exceed the cable rating, except for motor circuits, has been in general use. In this respect, the I^2t ratings confirm what has always been regarded as good engineering practice, and where overfusing is required they permit precise selection of fuse size to suit a cable.

The selection of h.r.c. fuses for feeder circuits can sometimes be simplified. The rating of the correct fuse for a distribution circuit is generally the nearest standard rating below the cable rating. Nothing is achieved by selecting a fuse-link rated at the circuit normal load current if this is appreciably less than the cable rating, except perhaps on the rare occasion when it is necessary for discrimination. The normal load current may well be raised at some future date, and it is probable that no-one will remember to put in a larger fuse. It is principally the cable which is being protected, and this protection is more than adequate if the fuse and cable ratings are approximately equal. This applies particularly in lighting and instrumentation circuits. The minimum cable size will probably be of the order of 15 amp, so that it will not be necessary to use a smaller fuse rating than 15 amp. This cuts down the stock of spare cartridges to be carried and makes the electrician's job simpler.

In all feeder circuits protected by h.r.c. fuses, the controlling switches must be capable of the following duties:

1. Making and breaking normal full-load current.
2. Making onto a short-circuit fault.
3. Making and breaking stalled-rotor current in the case of motor circuits.

The reason for requirement No. 3 is not always immediately apparent. Under normal conditions, it is the duty of the motor starter contactor to make and break starting and load currents, whilst the controlling fuse-switch acts as an isolator. It does happen, however, sometimes under stalled-rotor conditions, that a contactor does not open correctly, due either to a failure in the control circuit or to welding-in of the main contacts. Attempts then made

* Paper No. 2805: "Discrimination Between HRC Fuses," by E. Jacks (January, 1959).

to open the circuit with an "off-load" isolator, or an isolator capable of breaking little more than its load current, have had serious consequences; there are several cases of accidents from this cause, both ashore and in ships, some of them in quite dramatic circumstances.

For lighting and similar low-capacity circuits, tumbler switches of the required rating are readily available, although in some ships the lighting need not necessarily be switched at all, but may be left permanently "on." In such cases isolation of a circuit is achieved by removal of a fuse-carrier.

For straight switching of all other types of feeder, "on-load" fuse-switches are available up to 750 amp, and there is no reason why higher ratings may not be expected in the future.

Beyond 750 amp, then, it is not usual for fuses to be used for feeder protection, not because they are inadequate in themselves for protection, but because the size of controlling "on-load" switches is limited.

The alternative device for feeder protection and control is the air circuit-breaker, and it may be required for several reasons, including particularly:

(a) To control and protect feeder circuits above 750 amp.
(b) To provide remote or preference-tripping facilities for any rating of circuit.

It is when one is considering whether to use a fuse-switch or a circuit-breaker for a particular circuit of high current rating, that the difference in principle between the two is realised. Whilst the circuit-breaker can be arranged to operate at a relatively low current, its operation is very much slower than that of an h.r.c. fuse under heavy fault conditions. The h.r.c. fuse, on the other hand, operates when a pre-determined quantity of excess energy has passed through it, and under short-circuit conditions this is a fraction of the minimum fault energy passed by the circuit-breaker. This is the reason why the modern "on-load" fuse-switch is small and compact compared with a circuit-breaker of equivalent rating, although it can perform most of the same functions in a feeder circuit. The circuit-breaker cannot operate quickly enough to limit the initial peak of fault energy and, in consequence, as the short-circuit currents in a system rise, so the physical size of the circuit-breaker must rise with them. It is, therefore, in the interests of simplicity and economy to use "on-load" fuse-switches whenever possible. This policy is now being practised in modern a.c. ships to the extent that circuit-breakers are employed for alternator control and for grouped preference tripping only. Remote tripping of small individual circuits is carried out by contactors in conjunction with fuse-switches.

Circuit-breakers

When making up the specification for an electrical installation, the industrial engineer frequently has the choice of air circuit-breakers or oil circuit-breakers. The marine engineer, because the presence of oil greatly increases the fire risk in the confined space on board ship, and because maintenance is simpler, invariably uses air circuit-breakers.

Since a ship's main switchboard is always very close to the alternators forming the power supply, the prospective short-circuit current will be high compared with that obtained in a similarly sized installation ashore. Short cable lengths mean that circuit resistance will be low compared with reactance, and the fault power factor will likewise be low. Thus, a high degree of asymmetry in the fault current wave can be expected and the making duty for a circuit-breaker will be severe. BS 116:1952 specifies tests which cater for these conditions.

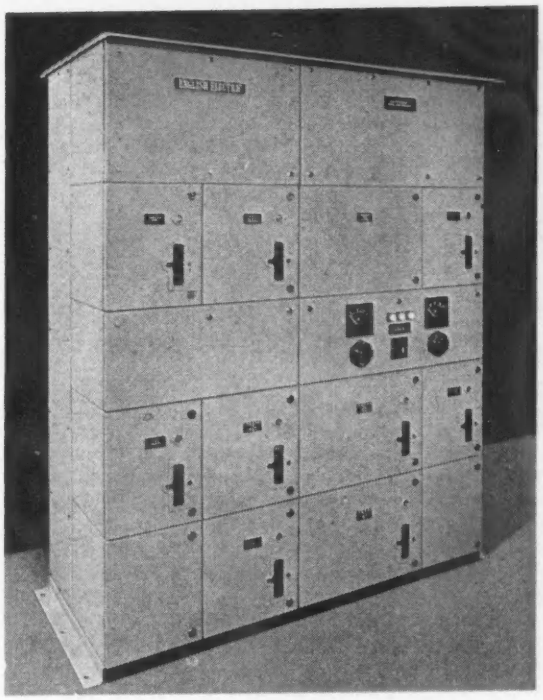


Fig. 3. Typical 440 volt sub-switchboard incorporating on-load fuse-switches

In industry, the length of cable between supply and distribution points is frequently long enough to introduce appreciable resistance into the circuit and a relatively higher fault power factor results. BS 936:1940 specifies tests for circuit-breakers operating under these special circumstances. It must at once be emphasised that these circumstances are not obtained in ships. Circuit-breakers to BS 116, therefore, should always be specified.

It should perhaps be added that both BS 116 and BS 936 are nominally oil circuit-breaker specifications, but they are being used and will be used for air circuit-breakers until such time as a separate air circuit-breaker specification appears.

To simplify the process of calculation and selection, circuit-breakers and fuses are classed in British Standards according to their symmetrical short-circuit rating. This is for convenience. They have been tested to the equivalent asymmetrical conditions of the prescribed severity. The asymmetrical short-circuit condition can, therefore, be considered to have been taken into account when selecting equipment, provided the correct British Standard is specified.

It is customary, when choosing h.r.c. fuses, to specify the highest category of duty as listed in the appropriate British Standard, BS 88:1952. This is because, in general, the size and cost of fuses is practically the same for all categories. This is not the case for circuit-breakers, however; their physical size and cost rise in proportion to fault current.

BS 116 gives three fault level ratings for circuit-breakers at 415 volts and these are 15·6 MVA, 25 MVA and 31 MVA r.m.s. symmetrical. At 440 volts the ratings are increased in proportion to the increase in voltage.

For the average cargo vessel or tanker, calculations will show that 15·6 MVA circuit-breakers are adequate, but when passenger ships are considered it will often be found that the fault conditions exceed the highest category of duty for circuit-breakers, i.e., 31 MVA at 415 volts.

Such cases must be given careful thought, since this maximum category was selected by a British Standards committee, comprising both users and manufacturers, as being the highest desirable consistent with good practice and design, notwithstanding the fact that circuit-breakers of higher performance are available.

To bring these prospective fault currents more in line with British Standard recommendations, either the primary distribution and generation voltage must be increased, or the number of alternators connected directly in parallel must be limited, by the use of reactors, bus-section circuit-breakers or by interlocking. Objections have been raised to all of these alternatives and the tendency recently has been to adopt the rather unsatisfactory compromise of using one of them and accepting some measure of fault current in excess of British Standard recommendations.

One further method of dealing with the problem of high fault currents has been employed in certain cases. It will be found that, because of their relative positions in the circuit, the more onerous fault current making and breaking duty falls, not upon the alternator circuit-breakers, but upon the feeder circuit-breakers, which, in addition, will normally be smaller in current rating and physical size. Often, therefore, the former are capable of the duty required and the latter are not. In such cases the feeder breakers can be backed up by h.r.c. fuses to give them the required fault rating.

It is usually necessary to carry out short-circuit calculations for the main switchboard only, especially if extensive use is made of h.r.c. fuse-switches. Calculations by the "percentage reactance" method are quite straightforward, because the total resistance of generators and their cables is normally negligible compared with the reactance, and vectorial addition is avoided.

Account must be taken also of the contribution of fault current from the maximum number of induction motors likely to be connected to the system at any one time. The effect of this contribution lasts for a few cycles only, and it will normally affect only the peak-making ability of the circuit-breakers and not their breaking capacity. The contribution from individual motors will vary according to their position in the system, but a useful estimate of the total can be obtained by assuming that they will contribute approximately three times their normal full-load current.

Alternator Protection

The extent to which protection is provided for an alternator is dependent upon its size and the degree of system reliability required. Since almost all marine systems are unearthed, protective equipment for alternators having their neutrals earthed will not be included here. In the following paragraphs, conditions typical of the circumstances which may arise are outlined.

Overcurrents resulting from overloading of the system. Overload conditions may occur when too few alternators are in circuit to carry the load on the system. A plain overcurrent release on the circuit-breaker controlling the alternator is not suitable for this condition, because tripping of one alternator will lead to progressive overloading of the others, until the electricity supply is lost completely. The only remedy is to shed some of the non-essential loads until more generating capacity can be made available. This is done by a preference-tripping relay energised from a current transformer connected in one phase of the alternator circuit. There may be one or two preference-tripping stages, which will operate in succession if the overload persists. Additional overload relays with a long time-setting may be included also as back-up protection if the preference-tripping devices should fail, or prove ineffective in certain instances.

Overcurrents resulting from short-circuit faults. In the typical scheme shown in Fig. 4, fault overcurrents can be initiated in three zones:

Zone 1. From feeder circuit-breakers or fuse-switches outwards.

Zone 2. Between alternator circuit-breakers and feeder circuit-breakers or fuse-switches, i.e., the busbar chamber and connecting risers.

Zone 3. From the alternator circuit-breaker up to and including the alternator.

Fault overcurrents in Zone 1 should be detected and interrupted by the feeder circuit-breakers or fuses. In the unlikely event of failure of one of these, back-up protection must operate to trip all the generators.

Every precaution is normally taken to ensure that Zone 2, which is the most vital zone in the electrical system, is not exposed to risk of a short-circuit fault. Nevertheless, main busbar faults have occurred in ships in the past, and the possibility that they will occur again cannot be ruled out; protection must, therefore, be provided.

Short-circuit protection for Zone 2 and back-up short-circuit protection for Zone 1 may be provided in several ways and the following are typical:

(a) Time-delayed overcurrent relay.

(b) Time-delayed under-voltage relay.

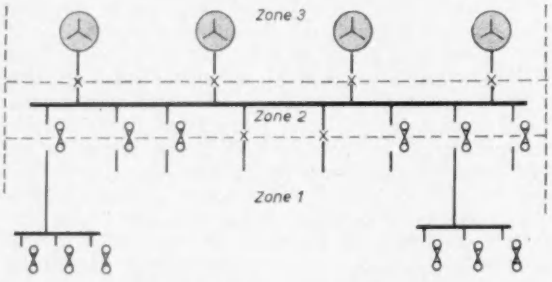


Fig. 4. Basic diagram of the main switchboard as installed in a typical passenger liner

Two types of relay may be suitable for time-delayed overcurrent relay applications, depending upon the time settings required. If a fixed time setting is chosen, an instantaneous attracted armature pattern relay will be used in conjunction with a timing relay having a fixed setting. If an inverse time delay characteristic is required, a simple and robust inverse definite minimum time relay will be employed. Both types of relay are used extensively and their reliability has been established for many years.

Whichever relay type is chosen, the setting will be such as to allow feeder breakers or fuses the opportunity of clearing faults in their zones. Because some modern alternators have a very high synchronous reactance, the sustained short-circuit current may actually be less than the machine normal full-load current and a special relay will be needed to cope with this condition.

Under short-circuit conditions the voltage at the busbars drops substantially and a time-lagged under-voltage relay can be incorporated to detect this. The time lag is incorporated so that the voltage transient upon switching and during synchronising will not cause maloperation.

Fault overcurrents arising in Zone 3 from interphase faults in the alternator windings, or in the cable between the circuit-breaker and the alternator, cannot be detected by devices in the circuit-breaker alone, since the fault current will not flow through it. Most suitable for this situation is "circulating-current protection," arrangements

being made to trip both main and field circuit-breakers so that the infeed of power from both the faulty machine and others in parallel is stopped. However, because of its relatively high cost and the low incidence of internal faults in alternators, it is unusual to find this form of protection specified, except perhaps for the size of machine to be found in the largest passenger liners.

Failure of the prime-mover to deliver power will result in the alternator being driven as a motor with the prime-mover as a load. This will almost certainly overload the remaining alternators and may result in damage to the prime-mover. A time-delayed wattmetric type reverse-power relay energised from a current-transformer in one phase is necessary to trip the alternator circuit-breaker.

Field failure protection can be provided quite simply by installing an undercurrent relay in the exciter circuit. Its purpose is to trip the circuit-breaker so that the alternator does not absorb heavy magnetising current from other alternators feeding the system.

Construction of Equipment

It is necessary in the design of all modern medium voltage a.c. electrical equipment for ships to place great emphasis on safety, not only the safety of the ship generally, but also the personal safety of operators and engineers who must carry out maintenance.

Interlocks must be provided for all switchgear and control equipment:

1. To prevent access to "live" metal.
2. To ensure correct operation of one electrical device in sequence with others.

Many of the interlocks are provided as a reminder, and they are normally designed so that they can be defeated for test purposes. This is very necessary, because otherwise engineers carrying out maintenance would tend to remove the interlocks altogether.

In considering the construction of switchboards, it is appropriate to deal with the main switchboard first as this is the most important part of the electrical installation. The vital nature of the main busbars has already been highlighted. They must be conservatively rated to avoid overheating and adequately braced to withstand the system short-circuit currents. For safety, they should be fully shrouded so that they cannot be touched either by operators or by falling tools. These precautions are equally important for the risers connecting outgoing circuits to the busbars. If such risers will not stand the maximum prospective current passing through them, either thermally or electro-magnetically, they must be protected by h.r.c. fuses having one terminal actually connected to the busbar. This precaution is, of course, essential for all potential connections to instruments and meters. Fig. 5 shows a busbar chamber incorporating all these features.

It is sometimes suggested that the main switchboard should be split into two parts, so that a main busbar fault will not shut down the whole electrical installation. This has been practised successfully in some cases, but there is a drawback that generally there would not be more than one alternator connected to each section, and failure of one alternator or its prime-mover would then result in loss of supply to half the ship. Economic problems in load sharing would also be likely to arise. A workable compromise has been used, and that is to provide removable links at intervals along the busbars; in the unlikely event of a severe short-circuit fault, the faulty section can then be disconnected in a few minutes and power restored to the remainder of the switchboard.

All circuit-breakers must be of the isolating pattern, and if they can be interlocked so that they are isolated within the cubicle before the door can be opened, so much the better. Maintenance can then be carried out properly and safely under reasonable working conditions. There is the added advantage that selected units can be made interchangeable.

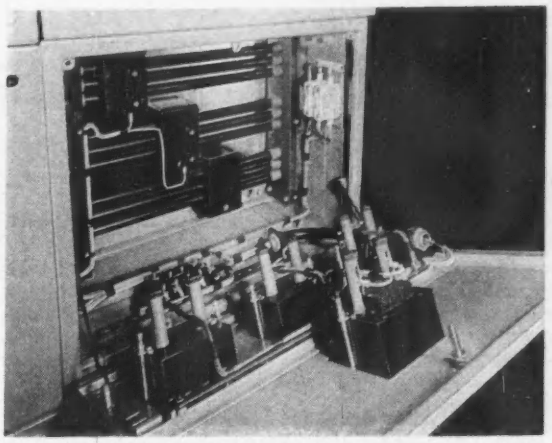


Fig. 5. Busbar chamber with hinged front cover lowered, showing position of potential fuses and fully shrouded busbars and terminals

Fuse-switches of the fully shrouded, double-break pattern are not made withdrawable, because non-deteriorating h.r.c. fuses require no maintenance and the occasional cleaning and greasing which is required for the switch contacts can be quickly carried out during the general overhaul. Similarly with fuse-switch/contactor units, since all maintenance work upon modern contactors can be carried out from the front, it is unnecessary to provide them with draw-out facilities, and they may be mounted in the switchboard cubicles upon fixed panels or frames. This simple arrangement avoids the isolating contact troubles occasionally met under conditions of vibration in an engine room.

Fuseboards

The construction of distribution fuseboards should be such that an operator removing or replacing a fuse carrier cannot receive an electric shock from any "live" metal within the case. This is particularly important in ships where the unearthed neutral medium voltage system is general, because the voltage to earth is not necessarily tied down to 250 volts.

Whilst fuse-fittings are not intended for switching duty, it must be recognised that, occasionally, a fuse will be inserted accidentally into a circuit upon which there is a short-circuit fault. The design should be such that this can be done in reasonable safety provided the fuse is inserted firmly and positively.

The Future

It has now been recognised generally that alternating-current systems can be applied to advantage in most classes of ship. The change from 220 volts d.c. to 440 volts, three-phase a.c. has done much to reduce the magnitude of fault currents, but this reduction is insufficient in some large passenger vessels, where prospective fault currents are considerably in excess of those recognised as a maximum by the British Standards Institution.

Whilst h.r.c. fuses can be produced to handle quite comfortably any fault level likely to be attained in ships, the same cannot be said for circuit-breakers, and it is to be hoped that the future will show a marked reduction in the present level of short-circuit currents.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

275 kV Underground Cables

MUCH confusion has arisen regarding the cost of substituting cables for the supergrid 275 kV overhead lines. A figure of £400,000 a mile has been mentioned in Parliament and elsewhere by people in most responsible positions, and has been misunderstood and misinterpreted by laymen. At a recent public inquiry, and as a result of other investigations, the situation has now been cleared up, and the true picture may be of interest to your readers.

The two standard sizes of overhead line have nominal ratings of 420 and 630 MVA per circuit, respectively, but in cold weather can be loaded to considerably higher figures—a feature not shared to the same extent by cables. But in practice many of the lines are never loaded beyond their nominal ratings, and are not likely to be. Clearly when considering the installation of cables in any particular instance it is the expected maximum load that should govern the size of cable rather than the extreme winter capacity of the standard overhead conductors.

Figures of £400,000 a mile and £250,000 a mile are often given as the cost of replacing the heavy and light duty overhead lines respectively by cable. Whilst every case must be considered on its merits, it will be found that £240,000 and £150,000 a mile are much nearer the truth for the purposes of general discussion, and with the advent of pipeline cables to commercial standards of reliability, these figures are likely to be further reduced.

Chartered Engineer.

Terminals for Aluminium

IN his letter "Terminals for Aluminium" in your issue of 21 July, 1960, Mr F. G. McDonald seems to be jumping to unduly hopeful conclusions from the point of view of aluminium in suggesting that the present troubles in the Congo will necessarily lead to (a) serious interruption in supplies of copper and (b) a marked increase in price as a result of such an interruption.

His reference to the relative prices of copper and aluminium cables is also very misleading. Most cables are cheaper if the conductors are of copper and it is only in the case of the larger power cables that any economic advantage can be obtained by using the lighter metal.

When the possible saving is fractional, as is often the case, the greater bulk of the aluminium cables, larger and more expensive joints, and the greater care needed in their preparation, outweigh any initial advantage.

On top of this, equipment and switchgear manufacturers have adopted compact designs which in some cases preclude the use of aluminium conductors. Surely Mr McDonald does not seriously expect manufacturers to re-design their products, and users to accept any additional costs, merely in order to accommodate him.

Veritas.

* * *

IT is admitted by *Veritas* that the larger power cables are cheaper with aluminium conductors than with copper, with copper at its present price. The larger the cable, the greater is the saving. And the higher the price of copper, the smaller the current rating at which aluminium begins to show a saving. If the saving is marginal for a 100 A cable, it will be substantial for a 200 A cable of the same construction, and enormous for a 600 A cable.

Objections are raised to aluminium cables—that joints are larger and more expensive to make, that cables are bulkier; these are just hoary old objections which can be taken as indicating simply that *Veritas* wants to keep on using copper. Aluminium cables are lighter and easier to install, and when the saving in the cable cost is 20%, jointing costs can be doubled without registering a change that is noticeable in the overall price comparison.

In the last paragraph of his letter, *Veritas* puts the case in a nutshell. Equipment and switchgear manufacturers have often adopted designs for terminals and end connections that preclude the use of aluminium conductors. Sometimes they preclude even the use of the right size of copper.

I do seriously expect that manufacturers should modify their designs to permit the use of aluminium conductors. What is more, I expect that the first manufacturers to do so will find they have added to the sales appeal of their products, and widened their markets.

F. G. McDonald,
ALCAN (UK) LTD.,
LONDON W.1.

Power Station Switchgear Practice

MANY of the controversies about power station auxiliary system design practice now current are dealt with in a recent English Electric Co. publication, "British Thermal Power Station Auxiliary Switchgear Practice," which ranges wider than its title indicates. In its early sections, especially, this study is at a distinctly higher level than the usual manufacturer's publication on applications of his equipment.

Amongst the problems discussed is that of fault rating of power station switchgear, and attention is given to techniques for avoiding the need to have switchgear suitable for the fault level possible for the short period that station and unit transformers are in parallel. The general conclusion is that the various make-before-break and break-before-make schemes possibly impose too high an electro-magnetic shock on motors to be acceptable in British practice.

On the subject of boiler feed pump drives for the highest unit ratings, account is taken of the merits of shaft-driven and turbine-driven pumps as well as various arrangements of motor drive.

After these discussions of some of the principles of power-station auxiliaries design, the book goes on to give detailed examples of electric auxiliary systems for turbo-alternator sets from 20 to 550 MW rating. Choice of switchgear is then discussed—here the origin of the study naturally becomes more intrusive—and this is followed by a chapter on protection and alarms. All-in-all, this is a reference book to be welcomed to the shelves of all concerned with power stations, whether from the design or operating standpoint.

12·5 MW geothermal plant in California

AMERICA'S first commercial geothermal power station is now nearing completion at Big Sulphur Creek about 75 miles north of San Francisco. The station will have, at first, a single 12·5 MW turbo-generator with steam conditions of 100 lb/sq in., 348°F, and a second set will probably be installed later.

The decision to exploit steam naturally occurring in the canyon known as Big Sulphur Creek was made by the Pacific Gas and Electric Co. after an extensive study of the steam resources in the area undertaken at the invitation of the owners of the steam wells, The Magma and Thermal Power Co's.

Geothermal Steam

Hot springs, fumaroles and steam vents were first found in the area in 1847, but it was not until 1920 that attempts were made to drill wells for marketable steam. At that time, the low cost of hydro-electric power made the method uneconomic to pursue, but in 1957 further drillings suggested that sufficient steam would be available at a competitive price to make geothermal generation practicable. A well was sunk in 1955 and a further five wells in 1957. While drilling one of these wells, the steam pressure blew out the nose of the hill.

The depth of wells drilled since 1955 varies between 523 and 1,404 ft, with steam production at 500 to 700 ft.

Little was known about the properties of the steam obtainable from The Geysers and although information was available on the Italian geothermal wells at Larderello and various projects in New Zealand, early tests at The Geysers showed that many of the contaminants in the steam were different from those in the overseas wells. A comprehensive series of studies was made in 1958 to assess the quantity and enthalpy of the steam sources, their entrained gas content, corrosive properties and the radio-activity of the condensate.

Steam flow and enthalpy were measured by fitting graduated nozzles over three of the existing wells which will supply the turbo-generator. The enthalpy was found to be about 1,200 B.Th.U./lb with steam flows, corresponding to a well pressure of 115 lb/sq in., between 26 and 111 klb/hr. The study showed that pressure fell quite sharply as the flow-rate increased, for example on the Magma No 1 well, a pressure of 180 lb/sq in., as measured at zero flow, fell to 100 lb/sq in. at a flow of 125 klb/hr.

Entrained gases in the steam range from carbon dioxide, averaging about 70% by volume of the total to ammonia with 1¼% by volume. Altogether the total weight of the entrained gases seemed to be about 0·75% at the designed rated steam flow to the turbine. If the flow was appreciably reduced a considerable increase in the percentage of non-condensable gases was apparent.

Corrosion Studies

At the outset it was realised that a major design factor would be the steps necessary to avoid corrosion troubles. Accordingly it was decided to study effects of corrosion with a model plant representing the steam cycle from turbine exhaust, through the condensers and steam ejectors to the cooling tower, with a steam flow of 310 lb/hr. To obtain the correct moisture content of exhaust steam, a heat exchanger was included in the model, cooled by water from the local creek. Corrosion measurements were made by a Corrosometer, an instrument measuring very small current changes due to thickness reduction across an area of the test material under corrosive conditions.

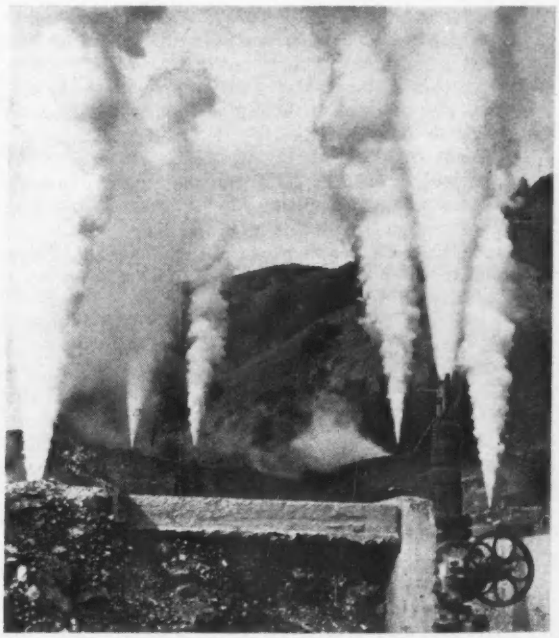


Fig. 1. Steam plumes rising high in the air before connection of steam-gathering mains to carry steam to the 12·5 MW geothermal generating plant at "The Geysers," California

With this instrument it was possible to predict in a week the rate of corrosion expected with different materials. Good performance was obtained with three samples of stainless steel tried, but a carbon steel specimen corroded very quickly.

The trials also showed that a build-up in ammonia content of the cooling water was to be expected in the cooling tower, making the circulating water slightly alkaline. The cooling tower also removed most of the entrained CO_2 and hydrogen sulphide in the steam changed into elemental sulphur.

Steam Cycle

Steam is brought to the power station from the wells through an 18 in. main and it enters the turbine through two butterfly valves 6 in. and 10 in. diameter. The cycle differs from a normal power station in several respects. Of major importance is the fall of steam pressure with increasing flow and also, of course, the steam pressures are lower than in a conventional station.

Since there is no boiler, condensate is not re-cycled and is used instead for cooling water make-up. This means that no other source of make-up water is needed, since the loss in the station cooling towers amounts to between 60 and 80% of the condensate and the remainder is available for recirculation in the cooling system. As steam is not required for recirculation, it was decided to use the less expensive "barometric" condenser in which exhaust turbine steam and cooling water mix, falling together into a hot well whence they are pumped to the cooling tower. To maintain the designed vacuum in the barometric condenser

of 4 in. of mercury absolute, steam ejectors are fitted to extract entrained gases and uncondensed steam, passing them first into an inter-stage condenser, and then to an after-condenser. Condensate from both these auxiliary condensers is also returned to the hot well, while the gases are discharged to atmosphere.

The main or "barometric" condenser requires 11,000 g.p.m. of cooling water at 80°F and the auxiliary condensers require a total of 510 g.p.m. A further 90 g.p.m. circulates through the turbine oil cooler.

Water from the hot well is pumped to the cooling tower and returns under gravity to a cold well ready for recirculation through the condensers.

The "barometric" condenser is estimated to enable twice the electrical output from the turbine per pound of steam as would be obtainable with a simple system exhausting to atmosphere. Turbine exhaust steam is led to the barometric condenser through an 84 in. diameter main. The condenser vessel is 10 ft diameter and 23 ft high. The mixture of cooling water and condensate falls through a tail pipe at the bottom of the condenser into a hot well consisting of a reinforced concrete pit. The tail pipe is 34 ft long and 30 in. diameter. A weir maintains a 2 ft deep water seal in the hot well at the bottom of the pipe, and water flowing over it is pumped back to the cooling tower.

Gases from the barometric condenser are removed to the inter- and after-condensers by steam ejectors consuming 5·5 and 4·9 klb/hr of steam, respectively, and with vacuums of 12 in. Hg absolute and 1 lb/sq in. gauge. The chief object of the third condenser is to prevent moisture condensing over the station in large quantities. The condenser internal cladding and the gas ejector fittings are formed from stainless steel.

From the hot well, water is pumped to three induced draught cooling towers. Here again corrosion effects require the use of stainless steel fittings, while for the cast-iron support columns, a Heresite coating has been applied. Plastics fill is used in the towers. The towers are rated for cooling 12,000 g.p.m. from 120°F to 80°F. Overflow from the cooling towers amounting to 12 to 40% is expected to prevent accumulation of undesirable chemicals in the cooling water system.

Steam Turbine

The turbo-generator set is a modified existing General Electric set built in 1924. The alterations include opening up steam passages, redesigning the two last stages in a total of nine to increase the steam flow and also to use stainless steel for the turbine buckets. Diaphragms have been replaced since deterioration of the original copper brazing by H_2S in the steam was anticipated. Although the steam suppliers are required to remove particles from the steam before it enters the turbine, it is expected that some finer impurities will remain and for this reason a swing-check emergency throttle valve is installed after the main throttle valve, so that, if the main valve sticks, there will be back-up protection with the second valve.

Electrical Equipment

The generator is rated 12·5 MW 60 c/s, 11·5 kV and is cooled by air drawn through external filters and exhausted through a duct in the station roof. It is connected through a 250 MVA metalclad air circuit-breaker to the station step-up transformer, rated 12·5 MVA, 11·5/60 kV and also to an auxiliary station transformer rated 0·65 MVA 11·5 kV/480V. Connections from the generator transformer to the 60 kV transmission line is made through a 69 kV, 1,000 A o.c.b. with an interrupting capacity of 1,000 MVA.

A new 60 kV spur on the Pacific Gas and Electric's Fulton-Hopeland circuit links to the station and has a capacity adequate for a further station of comparable power on the same site. Any additional units will be sited elsewhere, and will tie into the company's 110 kV system.

The station has been designed for automatic operation to the extent that any dangerous operating condition will shut down the plant and give warning in the nearest attended substation at Fulton. However, restarting of the plant after a fault in the station would be done manually. Provision is made to resynchronise the set automatically after a line fault which trips the main o.c.b. During such a fault the control will automatically govern the turbine to supply the reduced load for the 500 kW of station auxiliaries.

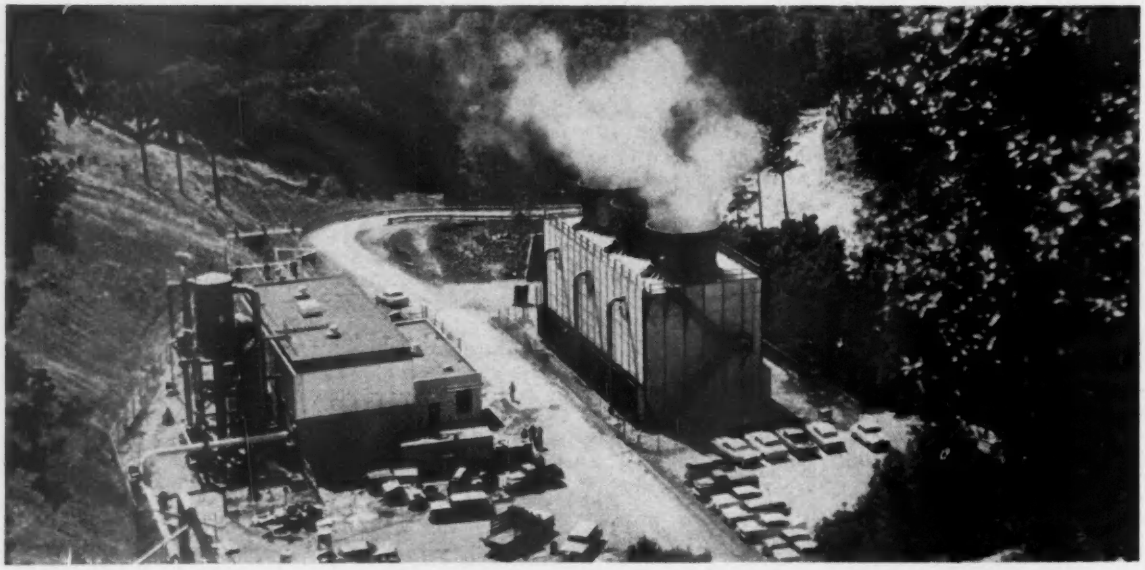


Fig. 2. On the left is the power-house with, behind, the barometric condenser and tail pipe to the hot well below ground level. The incoming steam main from the wells can be seen in the foreground. On the right are the three cooling towers

NOTES ON WIRING

BY MEGOHM

THE popular Press has given quite a lot of space to seven special houses referred to as "jig-saw homes" built recently in one of the new towns near London. As the name implies, the houses are fitted together rather like a famous type of puzzle and, it is claimed, wastage of bricks amounts to as little as 1% to 2½%, whereas building firms reckon on a 12% wastage for normal construction. Plumbers' pipes were installed without trouble or wasteful cutting and carpenters found that the joists fitted perfectly. The walls were "plumb" and the floors were true.

The only mention of anything electrical in reports on these houses was "a compartment next to the front door with all meters, coal bunker and room for a dustbin." I wonder just what the electrical installation consists of and what wiring system was used? I wonder why it is that we get so little news of electrical matters in such Press reports? Is it because the reporter is not too familiar with the electrical side or is it that the planner just put the "usual" system in these houses? Was a specialist consulted about the system to be installed?

Wastage

The above item about the "jig-saw houses" made me sit and consider the wastage of materials in the electrical contracting field. On every site one sees evidence of this, and, of course, building materials also. The wastage consists mainly of odd pieces of conduit, cables and saddles, etc., and I fully appreciate that the short off-cuts of conduit cannot be helped and can seldom be used. Of course there is always the scrap-iron merchant who will help but this rarely compensates to any degree. I remember in my apprentice days how we broke up all the old switches and salvaged the brass which together with all the old lengths of cable found a ready market at the travelling fair which visited the town once a year. Yes, indeed, times have changed.

Earthing to Water Mains

From statements made by the NICEIC it appears that water supply authorities are growing more vocal about the practice of connecting the main earthing lead for an electrical installation to the incoming water service to the same building. This, of course, has been almost standard practice for many years and is always done with little or no reference to the water authority concerned. Quite often the connection is made to the cold-water main at the most convenient spot with no investigation of that main at all. I have tested such earth connections during surveys and found them completely ineffective due to non-continuity at a stop-cock. Another fault is where the water mains outside the building are asbestos, and this occurs mainly in rural areas. If the water authorities continue to disapprove then we must have different thoughts on this most important point. The electricity authorities are normally sympathetic if they are approached on the matter with a request to bond on to their supply cable. However, contractors do well to remember that the authorities must be approached in each instance, where such a connection is required.

Is the time approaching when even the water authorities will have to be approached for permission to use their main as an earth? I would not be a bit surprised if this situation did arise, for the water engineers are becoming more important every day and, therefore, their word is becoming law. All this may well lead to a revision of ideas on earthing installations and I, personally, think it might be a good thing. If the water authorities object, then I feel that the electricity authorities should supply an earth terminal at every supply point. I cannot see any great difficulty about this, though I don't expect it to be done overnight. If every supply position had such a terminal available, tested and approved by the supply authorities, then everyone would feel much happier and know exactly where to work to. I realise that such an arrangement would be limited and if the authorities, on receipt of a request for a supply, decided that such an arrangement would not suit their requirements, then an alternative would have to be agreed.

Of course, there are engineers who have said for some time now that the practice of earthing to the water pipe was not quite correct and I can almost hear them purring with delight at these recent developments. I have heard many arguments on this matter and it now seems that I'll hear many more.

Plug Trouble

A friend of mine recently called to show me a 13 A plug which had given him some trouble and had, in fact, blown up whilst in use. The side was completely smashed and the inside was blackened and burnt beyond recognition.

I at first thought that the fuse inside had been of the glass pattern which I commented on some months ago, but I was assured that a correct fuse had been used and I was shown proof of this. My friend pointed out the trouble, which was a loose clip in which the fuse was held. This clip is fixed to the top of the plug pin in not a very robust way and it may well be that this fixing gave when the fuse itself was pressed into the clip. Anyhow, the result made quite a mess of the plug and the damage could have injured the person who had pushed the plug home.

We do not hear of many such instances and, if so, there is usually evidence of carelessness or misuse by the user. The case described above was not and was, in my opinion, due to bad design, as the fixing of the clip to the pin was weak. I intend to purchase one of this make of plug and experiment with it. It may well be that this particular plug was the black sheep of the family, but the damage was of such a degree that I felt it called for an investigation.

Of course, I could keep on commenting about plugs for many years. I have a variety of makes in my own house and treat them as many gardening enthusiasts treat their flowers. I have tried several of them on the end of my cleaner lead and have reached some surprising conclusions in that way.

Harnessing water power

W.P.C. PAPERS ON WATER-STORAGE AND TIDAL POWER

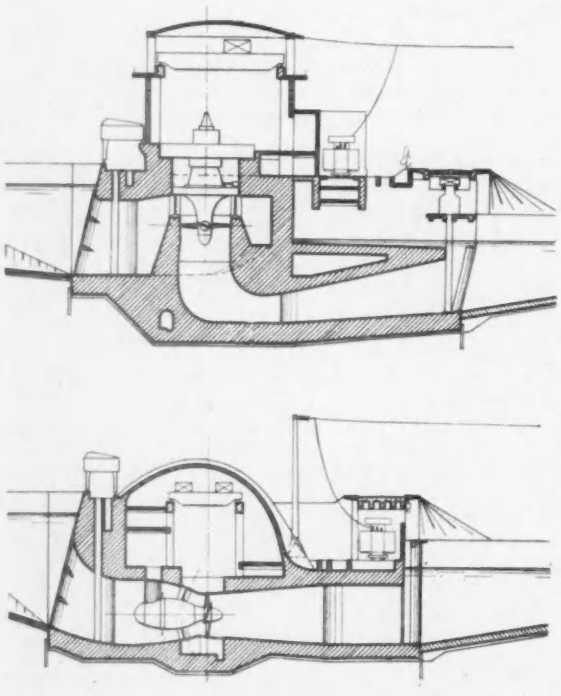
OF all the vast and inexhaustible water power resources in the world, only a small part will, for diverse reasons, ever be suitable for large scale hydro-electric generation. Of this part, the untapped natural high-head, high-flow sources which are the obvious first choice of the hydro-electric engineer represent a rapidly diminishing fraction. Increasing attention is accordingly being given to the harnessing of low-head and intermittent flow sources and, that elusive dream of all engineers, tidal power. The manner in which these problems are being tackled in the various countries is the subject of more than a dozen papers* presented at the World Power Conference in Madrid and they make interesting and instructive reading.

A Tidal Project

Taking tidal power as his subject, J. W. Leslie, of the US Army Eng. Div., surveyed the studies which have taken place over the past 40 years in the Passamaquoddy-Cobscook Bay areas without any construction ever being undertaken and detailed the latest project which, as the result of three years' investigations, was submitted to the International Joint Commission last October for review and recommendation.

Passamaquoddy and Cobscook Bay lie adjacent to each other on the Atlantic seaboard at the borders of Maine (USA) and New Brunswick (Canada). The former has an area of 100 sq miles and the latter, 40 sq miles, and in both the tides range from 11·3 ft, minimum neap, to 25·7 ft, maximum spring, or an average of 18·1 ft. In each tidal cycle some 70,000 million cu ft of water enters and leaves the areas. It is proposed to separate the two bays and isolate them from the Atlantic by earth dams pierced by controllable gates and to use the two in a high/low pool plan, the larger being filled at high tide and the lower emptied at low tide in a cycle which always ensures a difference of level between the two pools. This can be used to drive 30 10 MW fixed blade turbines, with a throat diameter of nearly 27 ft, at an average head of 11 ft. From this arrangement it is anticipated that an annual generated output of 3,063 million kWh would be achieved if operated in conjunction with an auxiliary hydro-electric or thermal unit to bridge the neap-tide periods.

*This is the fifth and final article reviewing papers presented to this meeting. The previous articles were in the issues of 16 June, 7 and 28 July, and 4 August.



Cross section of conventional low head turbine and tubular type reversible turbine-pump installations as discussed in the paper by Jackowski, Koban and Laski

River Cascades

Another form of low-head power system is described by Jackowski, Koban and Laski, of Poland, in a paper covering the hydro-electric systems on the lower Vistula. One project is for the development of nine dams in cascade without storage to drive turbines with a total output of 870 MW from which a total of 3,852 kWh per annum is expected. The second scheme incorporates pumped storage to enable peak-power production to be increased and the cost per MW to be reduced. The relative merits of Kaplan vertical shaft turbines and horizontal tubular turbine-pumps are discussed and, for the latter scheme, the tubular turbine-pumps are preferred.

Economics of Storage

A number of papers deal with various aspects of the economic factors affecting water storage schemes. J. A. Vicens, of Spain, deals with the co-ordinated running of a hypothetical system of hydro-power stations equipped with regulation reservoirs on a purely mathematical basis. L. Votruba and J. Tvaruzek, of Czechoslovakia, analyse the present load diagrams on the Czechoslovak electrical system and attempt to assess the importance of hydro, with and without storage, and thermal stations as base and peak load units. Some of the generating plant is obsolescent condensing and non-condensing steam turbine driven; elsewhere gas turbine sets up to 14 MW are being manufactured with units up to 50 MW in the design stage. The point at which obsolescent units can be replaced with newer units, or used solely for peak-load conditions, is also discussed. Prof H. Pozar, of Yugoslavia, in his paper describes a mathematical method of determining the most advantageous load allocation among storage-type power

stations and shows how it is possible to allocate loads between hydro and thermal stations for the most economic operation. E. J. Meier, of Switzerland, discusses comparative considerations on the economics of pumped storage schemes using pump-turbines as against segregated machines. Part of his argument is based on actual experience with reversible Kaplan turbines at Baldeney, the balance being based on laboratory model investigations. He makes the point that, with reversible machines, there are complications on the electrical side involving additional switchgear, tappings, damping windings and switches on the transformers which increase the price by about 15% with an overall loss of efficiency as a generator of 0·3% to 0·5% which, on a large generator, is not negligible. He concludes with the observation that, with modern interconnection of national grids, waste electrical energy is no longer available for pumping and the overall efficiency of any storage system as a self-operating unit, providing its own pumping energy in off-peak periods, is a vital factor in its economic consideration.

Prof P. G. Shenguela (USSR) mentions the losses of head in the backwater section which may, on occasions, reduce the annual output of a hydro-plant by 25% or more and suggests methods by which this loss of head may be utilised. In the paper by Dr K. Haager, F. Hartmann and O. Uitting, of Germany, the planning aspects of pumped storage installations without natural inflows are discussed at length with particular reference to the developments which have taken place in Europe and which have resulted in an increase in overall efficiency from 50% to 70% or more over the past 25 years. The authors deal not only with the turbines alone but the design of the reservoirs, pipelines, intake structures, pressure shafts and tunnels, all of which have an influence on the economic aspect of an installation. Dr C. Castellani, of Italy, points out that the geographical distribution of energy sources in a country rarely corresponds with areas of natural industrial development and suggests that the siting of electrochemical factories near unexploited sources may make their development as energy producers economic. Finally, S. Stage and Y. Larsson, of Sweden, examine the problem of economic operation of power systems comprising interconnected thermal and hydro plants and the manner in which long term storage reservoirs should be utilised.

New Hydro-electric Projects

In three papers dealing with recent and projected hydro-electric installations, only one, by T. Biernacki and B. Rudnicki, of Poland, incorporates water storage. This is the system recently brought into operation in Southern Poland which incorporates three hydro-electric stations at Czorsztyn, Solina and Wrzeszczyn with an overall installed maximum capacity of 457 MW. Of these, Solina and Czorsztyn have installed capacities of 75 and 321 MW, respectively, but, because of intermittent flows, the firm capacities do not exceed 62 and 240 MW, the yearly average being 50 and 120 MW. The introduction of pumped storage allows for an increase of installed capacity to 120 MW at Solina and 420 MW at Czorsztyn.

The paper presented by C. Berenhauser, Jr, of Brazil, outlines the electrification plan for the north-east of Brazil, and one by F. Goncalves Henriques and R. Preza, of Portugal, describes the hydro-electric developments which are taking place on the international stretch of the river Douro.

For some 60 miles of its course the river forms the natural border between Spain (Salamanca and Zamora) and Portugal (Tras os Montes). Under an agreement between the two countries signed in 1927, the use of the river for hydro-electric generation was divided equally, Portugal having the northern, or upper, half. In 1954, the concession to establish power stations on the section was granted to Hidro-Electrica do Douro, SARL who proceeded to develop and construct three hydro-electric stations at Bemposta, Picote and Miranda. The first of these, at Picote, came into service in 1958 with three 60 MW generators which, in winter, could be uprated to a total of 200 MW by using the water from the river for cooling the windings. The second, at Miranda, is in an advanced stage of construction and will provide a further 156 MW or, in winter, up to 172 MW. The third, at Bemposto, is only in its initial stages of planning though the dam site has been fixed.

In a paper by A. J. Dilloway, of UNECE, the hydro-electric resources of Europe were surveyed and a comparative study of the gross potential and its relation to the exploitable potential was outlined, using methods which have been developed and adopted by the Committee on Electric Power of the United Nations Economic Commission for Europe and its group of experts who have been engaged on the work.

Peaking Power Economics

To leave the hydro-electricity section of the conference, one of the many specific questions of economy discussed was that of meeting the peak demand on a power supply system.

Outline of an investigational process for determining if it is worth while installing special plant to meet peak load demand is presented in a paper by Mr J. K. Dillard (Westinghouse Electric Corporation). He comments that it is difficult to draw general conclusions about the economics of peaking power; each supply system has to be analysed, preferably by constructing a model of the system representing future loads. High-speed digital computers may then be used for experiments with such models.

General conclusions about some sources of peak power which Mr Dillard does accept include the following points about gas turbines: under emergency conditions they offer the facility of giving full output within 15 minutes from starting from cold and overload capability increases 5% for every 10°F decrease in ambient air temperature.

On diesel sets, he comments that the facility of start within 1½ minutes and automatic operation is to some extent offset by its need for high-cost distillate oil and increasing maintenance costs once operation exceeds 1,000 hours/year.

Illustrating his approach to peak load analysis by a system starting with 25 sets aggregating 3,400 MW of installed capacity, Mr Dillard draws another set of general conclusions. Basic to them is the belief that system revenue requirements may be minimised by gradually expanding a system with some optimum percentage of capacity installed as special peaking units. This optimum percentage is a function of type of peaking unit, savings in installed first cost, peaking energy required, rate of load growth, fuel costs and peaking energy costs. At present prices in the USA, between 6% and 12% special peaking capacity seems justified.

High load growth favours base load steam units rather than peaking plant, although even with growths as high as 10% p.a., small amounts of peaking capacity should be provided. It has to be remembered that peaking units increase overall production costs, through displacing more efficient steam plants, so they are most attractive where fuel costs are low.

Capital for Supply

A paper outside the usual run at the Madrid meeting was that by Mr A. D. Spottswood, who is chief of the Public Utilities Division of the World Bank. Taking the point that a steadily expanding supply of electrical energy is required for economic growth in all developing countries today, he argues that the capital for this must be found to a substantial extent by the supply undertakings themselves, through their tariffs. "It is surprising," he says, "how small in absolute terms the increases in tariffs need to be to provide annually the funds which will inevitably be needed to sustain future growth." Although percentage-wise, the figures may seem large.

How much self-financing should be attempted? World Bank borrowers covering 29 countries had set their tariffs sufficiently high to finance 20% to 50% of the cost of their expansion programmes from internal sources.

It is a mistake, in Mr Spottswood's opinion, to argue that low power tariffs are required for industrial expansion. Often managers of supply undertakings are forced to keep tariffs low, but "if those in authority would weigh the cost of holding electric power tariffs down to artificially low levels they would realise that the resulting lack of adequate power supply and poor service are much more costly to the economy than increases required to provide adequate tariffs."

Central Heating for Houses

WHAT the householder needs to know in making provisional decisions about central heating for his home is the subject of a book* shortly to be published for the Institution of Heating and Ventilating Engineers. Introducing the publication the President of the IHVE makes the point that the heating contractor has often seemed disinterested in the domestic field. One of the main reasons is that out of 50 inquiries received, only one or two ever resulted in an order because the inquirer is so often misled by advertisements into the belief that whole-house heating can be his for little more than the price of a packet of cigarettes. The present book aims to enable the householder to make his own comparisons, and to know what to look for and what to expect on discussing the requirements with the heating engineers.

The new publication restricts itself to central heating in the sense it is usually understood, with electric floor-warming included. In his comments, the president remarked that "There is a good deal of disagreement between the protagonists of that form of heating and those of conventional central heating, and we have tried to be fair." All forms of independent heaters, whatever their type or fuel, have been excluded from the discussions.

Types of Central Heating

In its technical sections the guide considers three main types of whole-house heating systems:

1. Systems using the circulation of hot water.
2. Systems using the circulation of warm air.
3. Systems using heated floors.

After the general discussion on prevention of heat waste, insulation, draught prevention and the use of thermostatic controls, six "typical" houses are considered as to heat requirements ranging from a two-bedroomed semi-detached house to a five-bedroomed detached house. For the former, full heating is assumed to involve 65° maintained temperature for lounge, 60° in hall, kitchen, landing and bathroom and 55° in both bedrooms. This is reckoned to require a heating installation capable of providing 30,000 B.Th.U./hr. On the other hand if background heating only is provided, with 60° in the kitchen and 55° in other rooms and spaces, 20,000 B.Th.U./hr is required. For hot-water supply, an additional capacity of 12,000 B.Th.U./hr is reckoned appropriate. The five-bedroomed house with full heat is reckoned to require 135,000 B.Th.U./hr.

The second part of the guide discusses various heating methods covering boilers and their installation, hot-water heating systems, hot-water supply systems, warm air systems and floor-warming systems. Afterwards comes what is likely to be the nub of contention about the guide, the collection of cost comparisons for various systems. These comparisons are based on the assumption of the following thermal efficiencies, an efficiency being defined as "that portion of the total heat in the fuel that is available when and where it is wanted, making allowance for overall wastage and degree of controllability."

Coke boilers	50%
Anthracite boilers	70%
Kerosine Boilers (vaporising)	70%
Oil boilers (atomising)	80%
Gas boilers	80%
Warm air furnaces	75%
Electric underfloor heating	70%

In justifying 70% efficiency allocated to electric underfloor heating, the guide remarks that published data suggest that about one-third of the heat emitted by electric underfloor heating goes to waste either outside the building or into it at night when not wanted.

Cost Estimates

Capital costs for the various heating systems discussed are given, with £80 estimated for an 8 kW 20,000 B.Th.U./hr embedded floor-warming system and £200 for a withdrawable system. Running costs are also discussed, and in this connection the assumption is made that 0·85d to 0·95d/kWh is a standard night tariff for electricity throughout the country. On this basis, the estimated cost of the electrical system is between £59 and £66. The cost with anthracite is the lowest for any fuel, at £19 to £25. As the heat rates increase the relative fuel costs shift. For the largest installation considered, oil has the advantage.

Cost comparisons on an annual cost basis, taking into account running and service charges and a ten-year write-off of capital expenditure gives £67 to £74 annually for the electrical scheme, compared with £49 to £60 for a warm-air furnace gas system, and as little as £44 to £53 for a small-bore hot-water system with coke-firing. For oil-firing the comparable figures are £60 to £61. A somewhat similar differential is suggested for the larger schemes which the guide discusses.

* "Central Heating in Your Home," published for the Institution of Heating and Ventilating Engineers, by Batiste Publications Ltd. Price 5s, post free. Available in about two weeks.

Machine accounting for supply

S W.E.B. CENTRALISED ACCOUNTING OFFICE

THE special problems of the South Western Electricity Board from the geographical aspect enhance the importance of close control of costing and immediate detection of uneconomic procedures. This gives point to the extent and detail of the wide range of management accounting processed in the Central Accounting Office in Plymouth, in addition to the routine billing of consumers handled there.

The Central Accounting Office uses an IBM punched card installation to extract a volume of information for management which would be impossible to produce economically by manual methods. The installation is based on three 604 electronic calculators, four high-speed 421 accounting machines, six dual-feed, dual carriage 441 accounting machines and ancillary equipment comprising key punches and verifiers, sorters, collators, summary punches and three 513 reproducers, of which two are equipped for mark-sensing.

Out of a total staff of just over 200, a data processing staff of 80 work in a pleasant, well laid out machine room in a modern building looking out over the Barbican with a distant view of the old Eddystone Lighthouse on Plymouth Hoe. There is little time for admiring the view. This installation processes upwards of 20,000,000 cards in a year in the course of billing sales analysis, payroll and labour costing, expenditure analysis, stores issue and receipt and accumulation of daily income and expenditure for incorporation in monthly, quarterly and year end accounts for the whole Board area.

The SWEB, the only board in the country with completely centralised machine accounting, is organised under head office at Bristol, of which Plymouth Central Accounting Office is part, and four group offices at Bristol, Exeter, Taunton and Camborne, Cornwall. Within each group are three to six districts each having a number of branch offices.

Daily Programme

The day begins in the Central Accounting Office at 7.30 a.m. when post is received and remittances notified from branches are matched with cards drawn from the debtors' file. A tabulation of these cards on the 441 is agreed with a control total mark-sense punched into a total card for each branch as a check on accuracy. Debtors' cards, for which part payment or overpayment is received, are mark-sensed and new balance cards are created by summary punch.

Daily remittances are cleared by 10.30 a.m., except on Monday, when the post includes remittances received on Saturday. Over the full year some £15 million in revenue is received from 130 cash collecting points and from 480,000 payments made by post direct to Plymouth.

Electricity consumption is recorded from meter books received daily from branch offices, the meter reading being punched into a prepared meter consumption card for each consumer, on which is already punched the reading for the previous quarter. These cards go to the 604 calculator which, in a single run, deducts previous from present reading, allocates units consumed on all meters for one consumer to one of three price blocks, makes an adjustment in the price blocks for a part-period, takes account of meter constants and prices the account, punching the value into the card on the 521. These cards are ready for billing on the 441 accounting machine after merging on the collator with cards for standing charges, such as hire purchase and hired apparatus cards. After arrears cards and goods accounts cards have been filed in, the merged pack goes into one feed on the 441, and multiple-line name and address cards, each one of which will print three lines, go into the other feed. An internal collator in the 441 matches the two packs and prints out the bill, name and address and item lines, printing simultaneously to save machine cycles. For each consumer number a new debtors' file card is summary punched on the 517.

Simultaneously with billing a tabulation is printed, on the second carriage, of all consumer accounts for use by clerical section, the right hand part of which is a tear-off stub going to local offices.

Additional Tasks

Twenty-one days after billing, final notices are prepared in the same way, usually some 3,000 every day. After a further seven days the arrears listing is prepared and this averages 1,000 per day. Few of these 1,000 are eventually cut off, and it is necessary to be sure that branch offices are informed of eleventh-hour payment. For this purpose a daily tabulation of cash received is sent to branches on the day of receipt.

Central Accounting Office also processes stores analysis down to weekly receipts, issues and returns, involving some 55,000 movements weekly on a total file of 125,000 balance cards covering 150 stores points. Each new purchase of stores may necessitate up-dating appropriate balance cards with the new average unit price.

Other expenditure, including wages, transport and other overheads is also analysed in detail, down to weekly job-costing and a monthly expenditure summary. Salaries and pensions covering some 3,000 individuals and a weekly payroll of 5,500 covering the whole area are also processed in the Central Accounting Office.

Very large sums are expended annually on capital account, in the acquisition of land and buildings and the extension and replacement of plant, machinery and equipment. This expenditure also is closely controlled on IBM cards. For each expenditure, heading cards contain the capital code and the amount authorised. With these cards are merged expenditure cards showing the amount allocated to date and a tabulation is prepared showing the balance remaining for inclusion in financial accounts.

The work of the Central Accounting Office of the South Western Electricity Board has already saved clerical costs far outweighing the cost of the data processing installation, at the same time providing management data.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Quebec Expenditure

Quebec Hydro-Electric Commission is planning capital expenditures of $724 million in the five-year period 1960-64. This was disclosed in connection with the recent issue of $50 million Quebec Hydro 5½% sinking fund debentures. The largest slice of this expenditure is $298·5 million for the Manicougan River power development, with a potential of more than 6,000,000 h.p. Preliminary work has already started on construction. During the five-year period, Quebec Hydro will also spend $144·2 million on construction of the Carillon development, designed as a peak load plant, to generate up to 626,640 kW for short periods. Three generators are scheduled to go into operation by the end of 1962, with nine more to follow in stages to 1966. Space has been provided for two additional generators. Other expenditures in the capital programme include: Bersimis No. 2, $4 million; Beauharnois No. 3, $9·3 million; Beauharnois hydraulic works, $25 million; new head office building, $21 million; thermal plant at Gaspe and additional cables, $12 million; substations, transmission, distribution and other facilities, $210 million.

Columbia Talks

Further discussions on proposals for Columbia River development took place recently between representatives of Canada and the USA. It is now suggested that a progress report may be issued shortly—an indication that at least some measure of agreement has been reached. Also, from Ottawa come reports that basic differences between British Columbia and Federal representatives over the proposals have now been patched up.

Warning on Valves

Seeking relief from import competition on the domestic market, Canadian radio valve manufacturers have made a direct approach to the Japanese Government. They have asked that the market for the common type of valve be left to Canadian manufacturers, while the valuable market for special valves (not made in Canada) could be met by Japanese firms. A brief to this effect has been put forward by the Electronic Industries' Association of Canada, who declared that the radio valve industry in that country is in danger of being wiped out by Japanese competition. It has been stated that 98% of such Japanese imports came from one firm—Hitachi, but at least four other manufacturers are considering the Canadian market. In 1958, Canada imported 214,000 valves from Japan, but last year the figure rose to 2,205,000 and may climb to 5,600,000 this year.

BRITISH GUIANA

Talks on Take-over

The battle over the Demerara Electric Co. seems to be nearing its conclusion—Dr Jagan, British Guiana's Minister for Trade and Industry, arrived in London last week, along with Mr W. P. D'Andrade, the acting Financial Secretary, for talks at the Colonial Office. Chief subject in these was the proposed acquisition of the Demerara Electric Co. and finance for a general electrification plan which it is estimated will cost over £8 million. The immediate aim is to obtain £2 million in order that the programme can start quickly. The Demerara Electric Co. has been operating under a 50 years' franchise, from 1927, but the agreement provides that after 30 years the Government has the option to either purchase the undertaking or renew the franchise. It is recognised locally that much of the plant of the undertaking is reaching a critical state—Mr C. McIntyre, the general manager, has said it will take at least three years to rehabilitate the plant to meet the consumers' needs. The company is reluctant to embark on major expenditure without some certainty of its future.

EL SALVADOR

World Bank Loan

To finance imported equipment and services for the construction of the Guajoyo 15 MW hydro-electric project, the World Bank has approved a $3,840,000 loan to El Salvador. The loan has been made to the Comision Ejecutiva Hidroelectrica del Rio Lempa, a semi-autonomous agency. Total cost of the project is estimated at the equivalent of $5,540,000, and the bank loan will cover the foreign exchange requirements for the plant and associated transmission lines. The loan is for a term of 25 years, with interest at 5¼%. Bankers Trust Co., Grace National Bank of New York and Manufacturers Trust Co. are participating in the loan, without the World Bank's guarantee, for a total of $87,000 representing the first two maturities which fall due in October, 1963, and April, 1964. It is estimated that the new Guajoyo power plant will meet the area's power needs until the latter part of 1964. At present, the only power station of the Comision Ejecutiva Hidroelectrica del Rio Lempa is the Guayabo plant on the River Lempa. That now has a capacity of 45 MW and is being extended to 60 MW by 1962. The new Guajoyo station will be erected near the Desague River, a tributary of the Lempa. The project is due to be completed by early 1963.

ITALY

Power Transmission

A plan for the establishment of a large steam power station on Sardinia, to supply power to Northern Italy via Corsica and a submarine cable to La Spezia, is now expected to be pushed ahead. The plan was fostered last year by Signor Giulio Pastore, who has been given a place in the new Italian Cabinet. The scheme aims at utilising the large coal deposits in a station to be erected at Porto Veshe. Transmission distance to the Italian mainland would be around 300 miles, and the plan provides for a short submarine cable across the Bonifacio Straits to Corsica, thence overland to Rogliano. From there the distance to a provisional site south of La Spezia is some 78 miles, which is considered feasible for a submarine cable, because the currents in the Northern Tyrrhenian Sea are not strong, nor would there be any problems of tides at either end of the cable.

NYASALAND

Nkula Falls Scheme

As a further step in plans for the Nkula Falls power development scheme on the Shire River, Nyasaland, the Government is to vote £100,000 on preliminary preparations, Mr J. M. Caldicott, Minister of Economic Affairs, has announced. The Nkula Falls project is a £3m scheme which will stabilise the level of Lake Nyasa as well as provide for power generation. The total demand for electricity in Nyasaland is at present just under 7,000 kW and the first stage of this hydro-electric scheme would involve the installation of one 8,000 kW set, provision being made for the addition of the second machine later.

KENYA

Fast Development

In the past few months the East African Power and Lighting Co. has had more inquiries for substantial blocks of power from potential industries than in any recent year, Mr A. J. Don, chairman of the company, reports. The company's business in Kenya has, in fact, taken a definite turn upwards, and its investigations, which are continuous, into new industrial developments give hope that this trend will continue. Substantial additional power sources must be provided in the immediate future. The point, therefore, has been reached at which the construction of the first stage of the Seven Forks hydro-electric scheme is essential. Good progress regarding the preliminary authorisations required has been made by Power Securities Corporation Ltd., with the various Ministries of the Kenya Government, and it is anticipated that the necessary water licence should be issued by the autumn of this year.

INDIA

Railway Loan

For improving and expanding India's railways, the World Bank has approved a loan of $70 million which will be spent abroad in the purchase of rolling stock and other equipment. The loan will cover the greater part of the foreign exchange required for the final year of the railway programme under India's second Five-Year Plan, ending March, 1961. One part of this programme is the electrification of 886 miles of main lines, in addition to the acquisition of hundreds of locomotives and passenger coaches.

Plant Production

The manufacture of switchgear, transformers and capacitors is included in the production programme of Heavy Electricals Ltd. up to March, 1962. After that date, a start will be made on the production of a higher range of switchgear and transformers. The board of the company has finalised arrangements for the import of machinery for the second and third phase of the project, when manufacture of traction and industrial motors, heavy rotating plants, water turbines, and rectifiers will be undertaken.

Station Approved

The Government of India have approved the Naharkatiya thermal power station project under which a power station, together with transmission lines, will be constructed at Kamrup in Assam. The power station, utilising the natural gas available from Naharkatiya oilfields, will have an installed capacity of 50,400 kW, provided by three 16,800 kW gas turbine sets. There will also be provision for an addition of two similar sets at a later date. Total length of the transmission system will be 416 miles.

Twelve substations will be established. It is estimated that the load demand on the power station will rise to 33,750 kW by 1965. Among the industrial units requiring power in the region are fertilizer, cement and oil plants at Kamrup, Bakajan and Moran, respectively. Ten estates, railways and other units will also be supplied with power by this thermal station. Estimated cost of the project is Rs 92,671 million—Rs 60,889 million for the generating station and Rs 31,782 million for the transmission system. Work relating to the projects will start in 1960-61.

PAKISTAN

Current Projects

The West Pakistan Government will spend Rs 10,46,30,000 on water and power schemes in Hyderabad and Khairpur Divisions during the current financial year. Of this, Rs 1,50,00,000 will be spent on the construction of a 20,000 kW power station at Hyderabad. Work on this power station has already been started. This project is being financed entirely out of Pakistan's own resources and the project will cost Rs 44 million. The Provincial Government have sanctioned a sum of Rs 1,54,00,000 for the construction of a 30,000 kW power station for Sukkur. This project will cost Rs 5,00,00,000. The Canadian Government have promised aid for this project and H. G. Acres Ltd., consulting engineers, of Niagara Falls, have given a feasibility report about the project. The scheme is scheduled to be completed by 1963. It will use Sui Gas fuel for the boilers.

AUSTRALIA

Extensions Finance

The State Electricity Commission of Queensland has just floated a £1,650,000 loan, which is intended to finance main transmission lines and rural electrification work. A proportion will also be utilised on extensions at the smaller power stations, mainly at Mackay.

Power Survey

The full report of Merz and McLellan, consulting engineers, on a plan for Queensland's electrical development over the next 20 years is expected to be completed very soon. The State Electricity Commissioner, Mr N. Smith, has revealed that some completed sections of the plan are already being studied by the State Electricity Commission. The full report will go to the Minister in charge of electricity, Mr Evans, for submission to the Cabinet. We reported on 22 Jan., 1959, that Merz and McLellan had been selected from several consultants with world-wide experience to undertake the task. Earlier this year it was suggested that the consultants envisaged the spending of £190 million on electricity development in Queensland in the next ten years. The report will contain firm proposals covering that period, with more general proposals on development over a further ten years. The terms of reference for the consultants involved technical and economic investigations, embracing the areas of the five regional electricity boards, the Southern Electricity Authority and Brisbane City Council. They were required to examine the existing generating facilities and transmission systems of the supply authorities, including a study of load centres, sources of fuel, and hydro potential. The practicability of using nuclear power at some future stage was also considered.

Change to Diesel?

The Kalgoorlie Electric Power and Lighting Corporation Ltd. propose to switch from coal to diesel power, at a cost of £500,000. The new diesel plant would provide the power for the North Kalgurli mine and gold mines of Kalgoorlie (Austr.) Ltd., but the latter concern have still to approve the scheme. Mr F. A. Davis, general manager of North Kalgurli, estimates that the saving there will be between £40,000 and £50,000 a year.

Valve Order

Boving and Co. Ltd. have received an order for 20 electrically operated valves, having bores ranging from 22 in. to 42 in. dia, for Darwin thermal power station, Australia. This station is to be constructed for the Department of Works. The contracts for the major plant for the project were placed some time ago, as we then recorded, Riley Dodds (Austral.) providing the boilers, ASEA the turbines and English Electric Co. the transformers and switchgear. There are to be two 7,500 kW sets, with oil-fired outdoor boilers. The station is scheduled for commissioning in 1962.

The last of three 90 MVA 260/66/11 kV transformers for Magill substation, Adelaide, of the Electricity Trust of South Australia, leaves the Bruce Peebles' Edinburgh works. With the others, it will link the 275 kV line from Port Augusta to the 66/11 kV systems in Adelaide

Personalities *in the industry*

Mr J. E. Yates

Mr J. Evans

Mr H. Twemlow

Mr B. O. Knott

Mr N. Hall

Mr J. E. Yates has been appointed general sales manager of Lancashire Dynamo and Crypto Ltd., and will be based at the Trafford Park works. He was previously export manager of LDC. **Mr H. G. Boullen** remains sales director of the company, operating from London.

The Minister of Power has reappointed the **Rt Hon Lord Geddes,** C.B.E., as a part-time member of the CEGB. The Minister has also reappointed the following chairmen of Electricity Consultative Councils: Southern—**Group Capt J. C. M. Hay,** O.B.E., D.L.; Eastern—**Alderman W. J. Bennett,** C.B.E., J.P.; East Midlands—**Mr L. L. Perkins;** and Yorkshire—**Councillor W. Leach.**

Station superintendent at Connah's Quay power station since August, 1953, **Mr J. Evans** has been appointed to a similar post at the Ince power station of the North West, Merseyside and North Wales Region of the CEGB (*ESH, page 74). Before going to Connah's Quay, Mr Evans was station superintendent at Blackburn Meadows for three years. In recent months he has been associated with construction of the Trawsfynydd nuclear power station.

The National Coal Board announce that **Mr R. F. Lansdown,** M.SC., A.M.I.MIN.E., has been appointed director of their Central Engineering Establishment at Bretby, South Derbyshire. Mr Lansdown has been the board's chief mechanisation engineer since January, 1956.

District commercial engineer in the Luton district of the Eastern Electricity Board, **Mr P. B. Clarke,** A.M.C.T., A.M.I.E.E., A.M.B.I.M., has been promoted to senior assistant commercial engineer (industrial power) at the board's Chiltern sub-area headquarters (*ESH, page 106). Mr Clarke has held his present position at Luton since 1953, following periods there as assistant commercial engineer (industrial power), and assistant district commercial engineer. He gained early experience with Manchester Corporation undertaking and, following a spell with the Admiralty, he was power sales engineer to the North Western Electricity Board from 1949 to 1951.

Appointed directors and joint general managers of the newly formed company, Jardine and Smith (Electrical Engineers) Ltd. (see page 217), are **Mr H. Twemlow** and **Mr B. O. Knott.** The new company has been formed from the acquisition of the electrical contracting department of J. S. Smith Ltd., of Bulwell, Nottingham, by Hardwick Industries Ltd. and its amalgamation with the latter's subsidiary, John Jardine Ltd., of New Basford. Mr Twemlow was group electrical engineer and Electrical Engineering Department manager of John Jardine Ltd. and is chairman of the Nottingham branch of the ASEE, as well as being hon secretary of the Nottingham Electrical Club. Mr Knott has been Electrical Contracts Department manager of J. S. Smith Ltd. and is a member of the Midlands Sectional Board of the Electrical Contractors' Association, and of the EIBA Midlands Section Committee.

The Caroline Haslett Memorial Trust (Electrical Section) has awarded a travelling exhibition to **Miss E. M. Ashburn,** of Lytham St. Anne's, to enable her to study the latest developments in domestic electrification in Western Germany. Miss Ashburn is senior demonstrator in the No. 4 sub-area of the North Western Electricity Board.

John Dossor and Associates, consulting engineers, have taken into partnership their senior engineering assistant, **Mr K. W. Whimster,** M.A.(CANTAB), M.I.C.E., M.I.W.E., who is in charge of the branch office at Worcester.

Lord Brabazon of Tara, who has been president of the Radio Industry Council since 1957, has agreed to serve for another year. **Mr E. E. Rosen** and **Mr Hector V. Slade** have agreed to remain chairman and vice-chairman, respectively, until the end of 1960. Following the sudden death of Air Marshal Sir Raymund Hart, director, RIC, **Mr R. Kelf-Cohen,** C.B., has been appointed acting director until such time as a permanent appointment is made. Mr Kelf-Cohen was Under-Secretary, Ministry of Fuel and Power, from 1946 to 1955.

Following the amalgamation of Edmundsons' interests in the Midlands, **Mr N. Hall,** formerly sales manager of the Radio and Television Department of F. Westerman (Wholesale) Ltd., has been appointed manager of the Birmingham branch of Edmundsons (Midlands) Ltd. Mr Hall entered the electrical industry in 1925 when he joined Edison Swan Electric Co. Ltd. After war service in the RAF he spent some time with Electrical Components Ltd. and later with Brown Bros. before joining F. Westerman (Wholesale) Ltd. in 1953.

The Engineering Group of the General Electric Co. Ltd. announces that it has reorganised its representation at the company's branches in Gt. Britain under five area chief engineers in order that the four areas in England and Wales for which they are responsible shall conform more closely with those of the CEGB's Generating Divisions and the Area Boards. The area chief engineers and the areas they cover are as follows: London, Eastern and Southern England—**Mr E. W. Molesworth,** at Magnet Hse, Kingsway (covering Central, North and South London, Ipswich, Southampton and Bristol); Scotland—**Mr J. R. Mercer,** at Waterloo St, Glasgow (covering Glasgow and Edinburgh); Yorkshire and the North East—**Mr V. F. Ellison,** at Gallowgate, Newcastle-on-Tyne 1 (covering Leeds, Sheffield, Hull, Newcastle and Middlesbrough); North Western and North Wales—**Mr O. S. Chalmers,** at Victoria Bridge, Manchester 3 (covering Manchester, Liverpool and Preston); and Midlands and South Wales—**Mr W. R. Greves,** at Newhall St, Birmingham (covering Birmingham, Nottingham, Leicester, Stoke, Gloucester, Cardiff and Swansea).

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* *Denotes revision to the "Electricity Supply Handbook, 1960."*

Important area board appointments are announced by the Ministry of Power; when **Mr T. M. Ayres** retires next December his successor as chairman of the North Eastern Board will be **Mr G. N. Green,** M.I.E.E., F.R.ECON.S., and **Mr J. D. Nicholson,** B.SC., M.I.E.E., will move from Yorkshire to become deputy chairman of the Board in 1953, Mr Green, who was trained with the St. Helens electricity department and subsequently served with the BICC, was city engineer at Peterborough on vesting day and for nine years was chief engineer of the Eastern Electricity Board. He was appointed deputy chairman of the N.E. Board in 1957.

Mr Ayres is remembered as the chief engineer of the former North Eastern Electric Supply Co., becoming chief engineer of the North Eastern Electricity Board on vesting day. He was promoted deputy chairman of the board in 1953, subsequently becoming chairman. The new deputy chairman, Mr Nicholson, after gaining first class honours at Glasgow University served with the former CEB, first in Scotland and later in London. On nationalisation he returned to Scotland, and in 1949 became deputy chief engineer of the Yorkshire Electricity Board. A year later he was promoted to chief engineer and in 1958 was singled out for appointment as a full member of the Yorkshire Board. These changes take effect from 1 Jan., 1961.

Mr Thomas Ingledow, president of International Power and Engineering Consultants, Vancouver, has been appointed a director of Balfour, Beatty (Overseas).

Mr K. E. Merefield and **Mr W. B. Sallitt** have been appointed directors of the Superheater Co. Ltd.

The Ministry of Aviation, with the agreement of the Commonwealth Relations Office, announces that **Mr C. J. Francis** has been appointed Counsellor (Defence Research and Supply) Ministry of Aviation, Canada, in succession to **Mr F. S. Barton,** C.B.E., M.A., B.SC., M.I.E.E., who is retiring from the public service. Mr Francis, who is 56, joined the public service in 1939 after 13 years' experience in the radio industry on sound recording equipment. During the war years he worked on radar equipment for navigation and blind bombing. In 1945 he became a divisional head at the Telecommunications Research Establishment in charge of work on defensive ground radar. In the following year he was made responsible for research and development of ground radar, navigational aids and blind landings. In 1954 he joined the British Joint Services Mission in Washington as superintendent, Electronics, and in 1957 was appointed assistant director Electronics Research and Development (Air) in the Ministry of Supply. Mr Francis will be leaving for Canada in mid-August.

Mr Peter Thorneycroft, newly appointed Minister of Aviation, and **Mr W. L. Smith** have resigned from the board of Pirelli-General Cable Works.

Mr F. Holmes has been appointed technical marketing manager for the Westrex Co. Ltd. Mr Holmes spent 20 years in the Fleet Air Arm as an air observer and electronics officer—since the war as staff electronics officer in the Ministry of Aviation, Admiralty, and with the British Joint Services Mission in Washington, USA. He retired from the Royal Navy two years ago to join Ultra Electronics Ltd. as liaison officer, later being promoted to projects manager. He has resigned that position to join the Westrex Company, a division of Litton Industries Inc.

Mr Ralph Hussey has been appointed a member of the board of directors of James Gordon and Co. Ltd. Mr Hussey was for 34 years a member of the staff of Elliott Brothers (London) Ltd.

The North Western Electricity Consultative Council has asked the Minister of Power to reappoint its present chairman, **Mr Frank Kenyon,** of Oldham, for a further period of at least 12 months. Mr Kenyon, aged 73, is due to retire on 30 Sept., after eight years as chairman, but so far no successor has been appointed.

Formerly general works manager at the Greenock factory of IBM (United Kingdom) Ltd., **Mr F. Baillie** has joined the Cambridge Instrument Co. Ltd. as production manager. There, he will be responsible for all aspects of production planning at the company's three factories in the UK. Prior to joining IBM in 1955 he spent a year with Muirhead and Co. Ltd. and, before that, several years with Kelvin and Hughes Ltd.

Previously London area manager of Burco Ltd., **Mr Gordon S. Hones** last week joined Ada (Halifax) Ltd. as sales manager of the Electrical Appliance Division.

The appointment of **Mr P. M. Hollingsworth,** M.ENG., M.I.E.E., M.A.M.I.E.E., as assistant chief engineer of British Insulated Callender's Cables Ltd., is announced, with effect from 1 July, 1960. Formerly chief engineer, power cables division, Mr Hollingsworth was born in 1906 at St. Helens, Lancs, and educated at Stonyhurst College and Liverpool University. He entered the cable industry in 1928 when he joined the outside engineering staff of British Insulated Cables Ltd. Two years later he was transferred to the Research Department at Prescot. In 1938 he joined Johnson and Phillips as head of the paper cable test and research department, and during the war took charge also of technical work on thermoplastic cables supplied to the Services. Immediately after the war he was appointed cable test and research manager of J. and P., with control of engineering and development for all types of cables. In this capacity he played a leading part in the introduction of aluminium-sheathed cables into the industry in 1948.

On his return to BICC in 1954 in the capacity of chief engineer, power cables division, he became responsible for design and quality as well as for development work on power cables and materials. In his latest appointment, in addition to his principal duties as assistant chief engineer, he will remain available to assist the power cables division in the handling of special technical power cable matters, including those overseas. Mr Hollingsworth will be stationed at 21 Bloomsbury St, London.

Mr R. C. Sprague has been elected a director of the Telegraph Condenser Co. and **Mr J. K. Sprague** has been nominated as an alternate director to him. Both are US citizens.

In its annual scholarships to staff members to pursue courses of advanced study or training, the General Electric Co. Ltd. have awarded two this year: one to **Mr L. M. Coulthard,** of GEC Engineering Works, Witton, and the other to **Mr T. A. Clements,** Osram Lamp Division, Wembley. The former will undertake research, leading to a PH.D. degree, in the Mechanical Engineering Department of Birmingham University, while Mr Clements will follow a postgraduate course in Applied Mechanics at Sheffield University.

Mr G. N. Green

Mr J. D. Nicholson

Mr G. S. Hones

Mr P. M. Hollingsworth

Mr F. Holmes

Heading a new division of English Electric combining all aspects of the firm's hydro electrical activities, is **Mr J. Gavin Warnock** who at present manages the company's Canadian associate, John Inglis and Co.

Managing director of the National Industrial Fuel Efficiency Service, **Dr W. A. Macfarlane,** PH.D., has been elected president of the Institute of Fuel and will be installed on 11 Oct. Dr Macfarlane joined the NIFES in March, 1954, as general manager, and was earlier at the Ministry of Fuel and Power, in which he became the first Director of Fuel Efficiency. This followed a period with the LMS Railway as senior chemist after a spell with the Fuel Research Station of DSIR.

Mr George H. Reid, B.COMM., who has served on the chief financial officer's staff of the South of Scotland Electricity Board since 1956 is to be the accountant of the board's Clyde area. (*ESH, page 165.) He succeeds Mr W. C. Malcolm who is joining the North Eastern Board in Newcastle.

Morphy-Richards are expanding their sales force, with **Mr D. S. Reid** appointed representative in the Scottish area; **Mr L. W. Swinnerton,** northern; **Mr R. E. Milledge,** midland; **Mr W. Read,** southern; and **Mr G. E. Johnson,** south western.

The appointment of **Mr A. Signorini** as general manager of Pirelli-General Cable Works Ltd. takes effect from 1 Aug. The position was formerly held by **Mr J. R. Harding** who has now taken up a post with the General Electric Co. Ltd.

OBITUARY

Mr W. A. Worth, who was only recently appointed purchasing officer of London Transport, died on 3 Aug., aged 59.

Formerly superintendent for the construction of Windscale and Calder Hall, **Mr H. G. Davey,** of the UKAEA, died last week at the age of 52.

We regret to report that the death has occurred of **Mr Alexander James Saunders,** manager of the Workington sub-area of the North Western Electricity Board. He was 60 years old, and started his career with the former Keswick Electric Light Co. at the age of 14.

Mr K. W. Wardrop, B.SC.(ENG.), A.C.G.I., A.M.I.E.E., a lecturer in the electrical engineering department, Imperial College, died on 6 Aug., aged 35, following a severe illness. Mr Wardrop followed education at Imperial College with post-graduate training with BTH Rugby and was later in the AEI Network Analyser department. He then joined the network analyser section of the then BEA, and in 1953 was appointed to the staff of Imperial College, London University.

ETU Eastbourne branch secretary, **Mr W. E. Satchwill** died after a swim last week. It will be recalled that Mr Satchwill featured recently in a dispute with the ETU on election voting.

NEW LITERATURE

High Productivity in Heavy Engineering

by A. G. Thompson, B.SC., A.M.I.C.E., M.I.E.S., A.M.I.W.

THE title of this volume is inclined to be misleading, the main objective being in the sub-title, "Production, Inspection and Cost Control in Welded Fabrication," since the work is almost exclusively concerned with that side of heavy engineering restricted to welding and welded fabrication. There are, of course, other sides to heavy engineering. The author has, however, performed a valuable service in compiling the information set down, for it gives a clear picture of methods and organisation leading to an efficient production unit for fabricated structures incorporating welded joints. Starting with a brief summary of welds and welding terminology, it proceeds, in logical fashion, to describe the preferred layout of fabrication shops, dimensioning techniques for accurate fabrication, the welding processes and their limitations, the associated machine tools, inspection, costing and productivity improvement. Much of the contents is based on shipyard experience which, after all, is a pretty sound basis for any heavy engineering. Published by Iliffe and Sons, 323 pages, 8½ in. by 5½ in. Price 65s.

Problems in Electrical Engineering

by S. Parker Smith, C.B.E., D.SC., M.I.E.E.

THIS is the seventh edition of the work of the late Professor Parker Smith which has been edited and brought up to date by his son, N. N. Parker Smith, B.SC., A.M.I.E.E., and now includes a total of 792 problems on electrical and electronic engineering. Since the sixth edition appeared in 1954, the advent of transistors into the electrical field has probably been the most significant development and the chapter on transistors and transistor amplifiers contains 27 problems in this branch of electronics. This is a useful volume for engineering colleges and schools from which to extract problems in examinations but, naturally, it is of little use by itself to the student since it gives no instruction but only the problems themselves. The fact that it has survived 30 years and seven editions with a number of reprints is ample evidence that it is filling a continuing need in the educational sphere. Published by Constable and Co.; 370 pages, 8½ in. by 5½ in. Price 20s.

Electrical Who's Who, 1960-61

THIS latest edition, again enlarged, will be welcomed by many people who have dealings with our Industry. Strongly bound to withstand frequent reference, the volume contains about 9,000 entries—over 1,700 people being included for the first time. It relates to men and women in all branches of the electrical industry, as well as engineers in the Post Office, Admiralty and Government departments, brief biographies being given in most cases. These are supplemented by an index to the entries, classified under the names of their companies or other organisations. In the ten years since its first edition, *Electrical Who's Who* has achieved a worthy status in most reference libraries, which this sixth edition will fully maintain. Published by Iliffe and Sons, 566 pages, 9 in. by 6 in. Price 35s.

Mathematics for Telecommunications Engineers

by S. J. Cotton, B.SC.(ENG.)

IT is the praiseworthy purpose of this volume to bridge the gap between the level of mathematics necessary to satisfy HNC examiners, and the level at which mathematics becomes useful in tackling practical problems (in this case in communications engineering) and following the arguments of authors of articles in professional journals. Mr Cotton feels that a basis for such a book is to be found in the fourth- and fifth-year syllabuses of the City and Guilds examinations in telecommunication, but in covering these requirements, he remains faithful to his main intention by distinguishing with asterisks those sections of his text which he thinks of interest only in terms of passing examinations. There is of course broad discussion of the calculus, with attention as well to the theory of functions of a complex variable, to harmonic analysis and vector analysis, special functions such as Laplace and Bessel (rather briefly treated) and to probability and statistics. Each chapter is provided with a number of exercises. Published by Chapman and Hall, 245 pages, 9¼ in. by 6 in. Price 37s. 6d.

BOOKS RECEIVED

Applied Electricity, by H. Cotton. Revision of text-book for Part 1 of London B.Sc.(Eng.) and ONC, with extension of chapter on electronics. Published by Cleaver-Hume Press Ltd., 516 pages, 8½ in. by 5½ in. Fifth edition, price 25s.

Household Electricity, prepared by Miss Mary George. Complete revision of the old favourite in the "Teach Yourself" series. Published by English Universities Press, 152 pages, 6¼ in. by 4¼ in. Second edition, price 7s 6d.

Roads and Their Traffic, by E. Davies. Collection of specialist articles on developing technology of "traffic engineering," prepared for the general reader. Includes section on road lighting. Published by Blackie and Son Ltd., 352 pages, 8½ in. by 5½ in. Price 35s.

Electrical Installation Practice, by H. A. Miller. Workshop notes for students working for City and Guilds electrical installation course. Published by Bell and Bain Ltd., 152 pages, 7¼ in. by 4¼ in. Price 6s 6d.

Introduction to Laplace Transforms for Radio and Electronic Engineers, by W. D. Day. Introduction with emphasis on use in engineering problems rather than rigid mathematical proofs. Published by Iliffe and Sons Ltd., 183 pages, 8½ in. by 5½ in. Price 32s 6d.

Fuel cell developments at Thornton

INTEREST in low temperature fuel cell development is heightened by the announcement last week of a significant advance by the development group working at the Thornton Research Centre of the Shell organisation under the direction of Dr C. G. Williams. Whereas fuel cells so far have been based on the use of hydrogen as a fuel and acid or alkaline electrolytes, Shell's interest derives from the concept that hydrocarbon fuels could also be used in fuel cells subject to the right form of electrode and electrolyte. The prime objective of the team has been the development of suitable electrodes for which a programme of fundamental studies has been carried out.

First fruits of this work are in the form of a new fuel cell with developed electrodes which, when run on hydrogen and oxygen at 3 lb/sq in. with either alkaline or acid electrolyte, will develop current densities of 70 A/sq ft of electrode area and, moreover, performance is hardly impaired if air is substituted for oxygen. An important advantage of the cell is that it is not affected by carbon dioxide which, in previous designs, has been responsible for a reduction in the activity of alkaline electrolytes. Since carbon dioxide is present in air and in most gases derived from hydrocarbon fuels, it is this factor which gives promise of an early break-through into the use of these fuels in the cells.

Dr D. P. Gregory and the 50 W fuel cell which has been developed at the Thornton Research Centre

Experimental cells of 20 units have produced 50 W of power at 25°C with double the output at 60°C. On this basis a power output of 3 to 5 kW/cu ft is possible, three to five times that obtainable from other fuel cells so far announced. A power-to-weight ratio for such units on a production basis is estimated to be about 50 W/lb. The next step, already under way, is to study the performance with fuels other than hydrogen.

Economics of building heating

"COMPARISON of domestic heating systems cannot be made simply in terms of the cost per unit of heat; this can only be done if all other factors, such as methods of control metering and charging, are the same." An important, yet logical, conclusion, this statement appears in Report for 1959 of the Building Research Board which, last year, completed its study of the performance of different types of space and water heating systems in flats and multi-storey blocks as an extension of its previous work on methods of house heating. The earlier studies had shown that the level of heating adopted by occupants varied according to the type of heating installed and opportunity was taken, in the second series of investigations, to further determine the characteristic temperatures which appeared to be acceptable with the different systems and why. It was found that, in average winter weather, the average indoor temperatures in flats with central heating was some 20°F above outdoor ambient, while those using solid fuel appliances appeared to be content with 16°F to 17°F above and those with underfloor heating only 14°F above.

Why this should be is not completely explained (if, indeed, it ever could be) but there is the faint suggestion that the lower temperature acceptable with underfloor-warming may be due to the fact that feet get warmed whereas, with other systems, cold feet and warm heads are the more usual experience. Certainly, there is evidence that greater economy of heating is found where occupants have some form of control over the heating, though central heating systems tended to run for longer seasons where the occupants have control individually than when it is turned on and off at specific dates. In terms of consumption alone, it is suggested that 1,200 therms per annum is the usual order for central heating per flat as against 600 for solid fuel appliances and 300 for floor-warming. The final costs, inclusive of installation, maintenance and replacement, which "are considerably lower than fuel costs," are compared in a publication now in course of preparation but, since the final judge of the heating system is the occupant himself, his own reaction to the various methods is also the subject of an extensive field survey.

Lighting in Tall Buildings

On lighting, most of the comment this year is on the modern architect's approach to lighting in the present day concept of tall office buildings, which is necessitating a replanning of traditional methods of assessment for lighting and the avoidance of glare. It is becoming increasingly costly to admit full daylight to the furthermost parts of the modern office and a recognition of the fact that it may be cheaper to install permanent artificial lighting rather than to juggle with window space is gaining ground. Even where some daylight is admitted, the use of supplementary lighting on a permanent basis has a sound justification as preliminary studies by the board's scientific investigators have shown.

An important result of recent work has been the acceptance by the Ministry of Education of the technique of comparing costs between fluorescent and filament lighting, which has finally established that the additional cost of fluorescent lighting in schools can be paid from the savings in running costs over two years with, of course, immeasurably better levels of lighting.

Among other matters covered in this year's reports are studies, currently in progress, of concrete structures used in nuclear power station construction and the use of fly-ash from pulverised fuel power stations for brick manufacture.

for the electrical trade

Heating on the panel

A "PANEL" space heater for wall-mounting or free-standing application has been produced by Johnson and Starley. It is actually two plain rectangular panels, 28 in. wide by 23½ in. high, with gold-toned trim sandwiching a one kW heating element embedded in fibreglass. The result is a screen which can be mounted on wall brackets or fitted with tubular supports to match the trimming, and should look quite effective standing in front of a fireplace.

Surface temperature never rises above the BS recommended 80°C, the panel possibly being most useful as a background or out-of-season heater. It has the outstanding advantage of being particularly good-looking, its bare broad front in off-white, pink or grey presenting a tidy yet decorative note in any weather. Known as "Waifair" the heater sells at £6 19s 6d, tax paid. Distributors, *Brown Bros, Gt. Eastern St, E.C.2.*

Shaver price cut

FOLLOWING the introduction by several manufacturers of low cost electric shavers, Remington are reducing prices substantially on the three models of their 657 range. Effective from 1 Sept., 1960, "Standard" will sell at £9 5s, tax paid; "Triple-volt," £9 19s 6d and "Auto-Home," £10 15s—all reductions of well over £1.

Low cost washer

A WASHING machine aimed at the low cost market, created by credit restrictions, has been introduced into the "Brunlec" range of appliances. Known as the "Popular" it has a 3 lb capacity tub and plastics pulsator unit, driven by a ⅓ h.p. motor. To this basic cabinet can be attached a hand-operated fold-away wringer and a vitreous enamelled table top. The appliance stands 35 in. high with 16 in. depth and 17 in. width and is finished in white or cream stove enamel. Price, £12 12s basic, tax included; wringer, £5 15s. and table top, £1 1s. *Brunlec Appliances Ltd., Junction Mills, Junction St, Burnley.*

Striplight for the table

A TABLE lamp incorporating a 284 mm striplight—a simple and out-of-the-ordinary idea—will be available in September. This fitting, which was shown in prototype form at the ASEE Exhibition earlier this year, consists of a 30 or 40 W tubular lamp fitted vertically on a brass supporting arm with a circular base of polished wood. Its tall slim "Gaylite" shade, in off-white, pink, or yellow gives the whole thing a height of 17¼ in. Price of the fitting, known as "Gaylux GX 1" is £3 13s, tax paid. Extra lamps sell at 6s 9d and 7s 1d. *Linolite Ltd., 118 Baker St, W.1.*

TRADE PUBLICATIONS

AMPLIVOX.—Loose-leaf catalogue of data sheets describing electro-acoustic products. Amplivox Ltd., Beresford Ave, Wembley, Middx.

STC.—Technical Data Sheet C/2050, Ed. 1, on transmission equipments—repeatered submarine cable telephone projects. Brochure giving salient features of Strad high-speed automatic electronic retransmission systems. Pamphlet, C/4010, Ed. 1, on microwave telecommunications network in Sweden.

NEGRETTI AND ZAMBRA. — Publications R/30/RU—Air-operated control regulating units; H.23—Gregory type electrolytic differential humidity indicators; R/43—Electrical contact controllers, indicating and recording types; R/42—"Gas-stat" controllers, indicating and recording; T/48—General purpose Mersteel rigid stem dial thermometers.

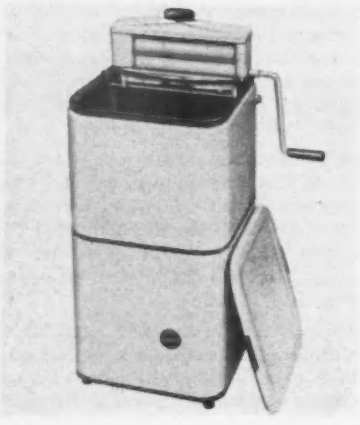
Lever-adjusted infra-red fire

A FEATURE of the Tack infra-red wall heater is its safe reflector adjustment control, which enables the user to alter vertical alignment whilst it is alight and without having to handle the casing in any way. The control is effected by a small insulated lever protruding from under the back plate. The fire employs an 800 W element of the familar silica-sheathed type, a chromium-plated reflector and a safety guard to BSS. Finished in white stove enamel it sells at £5 10s, tax paid. Extra elements can be obtained for 5s. *The Tack Organisation, Longmoore St, S.W.1.*

The new type fan heater

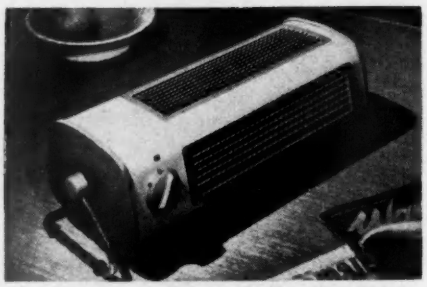
THE tangential fan heater is on its way in. This type of spaceheater/air circulator which has been favoured in German markets for some years must have made British manufacturers sit up when they encountered it at the last Hanover Fair, for at least two firms here have produced models ready for the autumn rush. Inevitably imported models have found their way on to the market, and as word of the new heating appliance gets around they will find a ready consumer public.

In at the start is "Turboflo." It is an efficient heater by any standard, with its 3 kW rating and wide range of control. A single rotary switch beside the front grille has six positions—off; low speed/cold; high speed/cold; low speed/750 W; low speed/1,500 W and high speed/3 kW. The thermostat incorporates the usual safety cut-out device which operates in the event of fan failure. The fan forces a large volume of air over the elements and through grilles in the front and top of the case which, the makers claim, hardly rises above room temperature. A tangential fan need not rotate at any great speed and as a result is quieter than the conventional type. This model in fact is claimed to be near silent. "Turboflo's" cabinet, long and narrow, is constructed of the new plastics-coated steel and mounted in a chromium-plated stand which allows vertical adjustment. The heater sells at the reasonable price of £12 3s 6d, tax paid. Dimensions: 19 in. long, 6½ in. high and 18 in. wide. *Engelhard Hanovia, Bath Rd, Slough, Bucks.*



"Popular," the 3 lb capacity washing machine from Brunlec is priced £18 7s with the wringer. Table top £1 1s extra

A table lamp fitting, "Gaylux", which employs a 284 mm. strip-lamp. £13 13s



"Turboflo" one of the new tangential fan heaters. 3 kW, dual speed and 3-heat control. £12 3s 6d It is said to be almost noiseless

equipment for industry

Lightweight fire extinguisher

WEIGHING only 19½ lb, the Nu-Swift Model 1505 carbon dioxide fire extinguisher is intended for fire fighting at close quarters and is said to be particularly suitable for fires involving indoor electrical equipment. The extinguisher has a mean range of 11 ft in still air and a specially designed diffuser is claimed to enable an experienced operator to extinguish a 9 sq ft inflammable liquid fire in the 8 sec. during which carbon dioxide is being expelled. The extinguisher is leak-proof and has a strike-knob. The 5 lb carbon dioxide charge can be reloaded within a minute. *Nu-Swift Ltd., Elland, Yorkshire.*

New motor-cycle battery

LONGER active life and a more robust construction is claimed for type 3 KT 5 motor-cycle battery superseding model 3KSR7. This 6 volt battery has a 13 Ah capacity and measures 4¼ in. by 3$\frac{9}{16}$ in. by 6¼ in. high. It has Porvic plate separators and is housed in a hard rubber container. *Pritchett and Gold and E.P.S. Co. Ltd., 137 Victoria Street, S.W.1.*

Low-water alarm

A SIMPLE control panel to shut down unattended automatic steam boilers if the water level becomes excessively low is now being marketed by Kingston Control Systems. The wall-mounting panel, measuring 7¼ in. by 5½ in. by 2¼ in. deep, contains a relay operated by a low-level switch. A warning light and test button are included on the panel and a reset button, also provided, must be pressed before the boiler plant can be restarted after operation of the low-level relay. The burner control circuit is rated 3 A 50 V and an alarm bell and extra low-level switch can be supplied if required. *Kingston Control Systems Ltd., Empire Chmbrs, 167 Clarence St, Kingston upon Thames, Surrey.*

P.V.C. sleeving

INCREASED service reliability combined with good ageing properties and freedom from tropical mould are the predominant qualities of VS sleeving introduced for high temperature processing and applications. The sleeving is intended for operation at temperatures up to 105°C. It has a viscose silk internal reinforcement to give flexibility and avoid shrinkage during baking with a plasticised p.v.c. outer coating giving resistance to impregnating oils and varnishes. Sleeving is available in 11 colours from diameters of 0·5 mm to 5 mm. It has an insulation resistance of not less than 1,000 megohms and a breakdown voltage of 3 kV when tested in accordance with BS 2848/57. *Permanoid Ltd., New Islington, Manchester 4.*

Battery sizes halved

DOUBLING the capacity of a given battery size by improved plate materials and plastics separators gives valuable size and weight reductions in the latest range of Tungstone high performance Planté cells. The new stationary batteries employ a pasted negative plate enabling the number of plates in a cell to be nearly doubled when used in conjunction with new dry-microporous plastics separators. For example, one of the new high performance cells has a capacity of 200 Ah from the same dimensioned container as the conventional 100 Ah battery, while the one minute capacity has increased from 125 to 600 A. Even higher performances are possible for switch operation duties. Where the discharge period is limited to 3 sec, the current taken may be 680 A instead of 140 A with the conventional cells. The high performance cells, which are supplied filled and charged with capacities up to 400 Ah at 10 hour rate are intended for switch-closing, engine starting and standby duties. Details are given in a catalogue published by the makers, *Tungstone Products Ltd., St. Bride's Hse, 10 Salisbury Sq, E.C.4.*

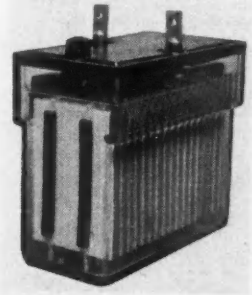
Cutting boiler repair time

SEVERE local corrosion in boiler tubes at Bromborough power station last year required cutting out and replacing a number of sections in the 2¾ in. diameter boiler tubes. Previously this work has largely been done by hand, but by producing a smaller version of their "ALYN" bevel cutter, BOC were able to reduce time from one hour to ten minutes per cut. The new cutter is now in production. It incorporates rotary gas valves and an original method of micro-setting the position of the tube cut. *British Oxygen Gases Ltd., Spencer House, St. James's, S.W.1.*

Line taps in nylon

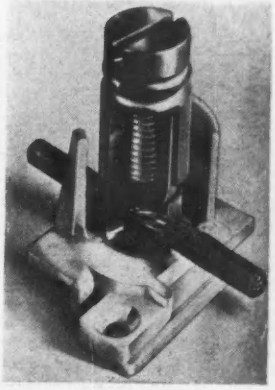
SEVERAL valuable features are claimed for a new series of line taps now available. Made in five sizes, these taps are suitable for use with cables, busbar connecting devices or trunking systems and are shrouded in a virtually unbreakable nylon cover. Cables are held in the line taps by a U-shaped clamp claimed to give a permanently low resistance connection, even after the cables have "settled." Pressure is applied to the cables by a clamping screw and maintained by a captive lock washer said to be vibration proof. In addition to providing a shock, heat and moisture proof enclosure for the brass inserts, the nylon shroud prevents the cables "spreading." Six types of the tap are available for various types of connections. These line taps are suitable for cable cross-sections of 11 to 88 circular mils and can be supplied with coloured

◀ *Wall-mounting boiler low-water level alarm panel for automatic plant made by Kingston Control Systems*



This Tungstone high performance battery has twice the capacity of a conventional cell of the same dimensions

These cable connecting line taps in nylon shrouds have a "non-spread" clamp. They are available from British Central Electrical ▶



nylon caps for identification purposes and to give complete insulation. *British Central Electrical Co. Ltd., 6 Rosebery Avenue, E.C.1.*

Plastics price reductions

OUTSTANDING resistance to both heat and fluids is the main claim of fluoroelastomers marketed by Du Pont under the name Vitons. Price reductions to certain of these compounds means that all three types: Viton A, A-HV and B all sell for 88s per lb. *Du Pont Co. Ltd., 76 Jermyn St., S.W.1.*

Low-cost silicon diodes

THE range of Tri-sealed power silicon diodes has recently been extended by five types with peak inverse voltages from 400 V to 800 V and ratings up to 450 mA at 55°C with a capacitive load. These diodes are particularly suitable for power supplies in radio and television sets and electronic equipment. The same company are marketing a handbook which deals comprehensively with application of zener diodes. *International Rectifier Co. (Great Britain) Ltd., Hurst Green, Oxted, Surrey.*

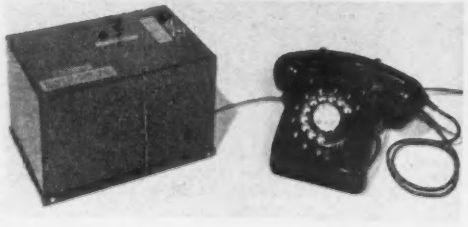
Contact lubricant dispenser

CLAIMED to mechanically lubricate, prevent burning and lower resistance of electrical contacts, "Electrolube" is now available in a handy pocket dispenser. The dispenser will deliver either a drop or a stream of the lubricant. Electrolube is made in two versions for non-arcing or arcing contacts. Among the many features claimed for Electrolube are its chemically inert, water repellent and arc quenching properties claimed to loosen films on electrical contacts and to increase brush life of machines. *Electrolube Ltd., Slough Estates Hse, 16 Berkeley St, W.1.*

Burglar alarm uses phone

EMERGENCY services may be called automatically when burglar or fire alarms operate with the recently announced Auto-Alarm Dialler. The dialler consists of a fully transistorised amplifier and magnetic tape which will transmit over GPO lines one of two emergency calls if a burglar or fire alarm should operate. The auto-dialler calls the emergency number, usually 999, although alternative numbers may be used. The telephone handset and dial are not used. It is silent in operation, and has a muting switch and reset control for monitoring and test purposes. The Auto-Alarm Dialler operates from a 24 V d.c. source and it is housed in a case measuring 10 in. by 7 in. square. *Southern Instruments Communications Ltd., Camberley, Surrey.*

A handy pocket dispenser is now available for "Electrolube" contact cleaning and lubricating fluid



The Southern Instruments auto-alarm dialler puts through a direct emergency call if an associated fire or burglar alarm operates

Cable tape combines electrical and mechanical strength

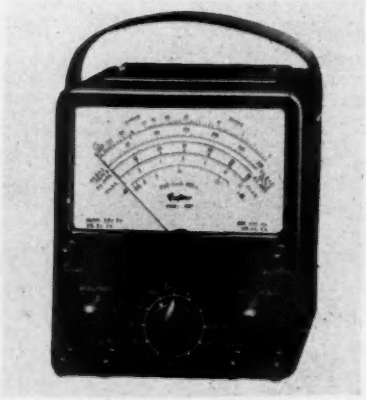
EXCELLENT electrical properties combined with mechanical strength and corrosion resistance are claimed for a new cable jointing tape, Polythene-based Self-amalgamating tape, formed from a mixture of polythene and synthetic rubber giving a strong yet highly extensible compound. The tape has a thickness of 0·02 in. and is available in black only, interleaved with a thin black plastics film to preserve its properties. When applied under tension the tape welds itself into a homogeneous mass within two or three days without application of external heat or pressure. So firm is its contact with a cable dielectric that no water penetration along the interface has been detected even after prolonged immersion. The tape is claimed to be resistant to water vapour, corrosive atmospheres, dilute acids and alkalis but it is attacked by oils, including petrol, greases and solvents. The tape is suitable for jointing polythene and irradiated polythene cables, vulcanised rubber or polychloroprene and p.v.c. Typical electrical properties are a volume resistivity of 7×10^{15} ohm-cm and an electrical strength of 500 V/mil. Laboratory tests have shown that a combination of electrical and mechanical properties can be obtained by using two or more types of tape. For example, pure rubber or self-amalgamating rubber tapes while having excellent electrical strength have little mechanical resistance and are attacked by grease, oil and solvents. To protect such tapes against acid, oil and solvents it would be necessary to apply a friction tape and possibly also a p.v.c. adhesive tape. The new Polythene-based Self-amalgamating Tape is strong and highly extensible and does not have the rigid and elastic properties of polythene materials. It is also resistant to ozone.

For special applications, for example, where slight gas leakage must be prevented, black adhesive insulating tape can be used as a reinforcement and a final covering of p.v.c. plastics adhesive tape will give a tough covering with some protection again oils and solvents. Where considerable radial thickness with corrosion resistance is required, rubber splicing compound can be used to build up the radial depth cheaply over the corrosion resistant polythene based tape. P.V.C. plastics adhesive tapes may be applied finally for protection against solvents and corrosive atmospheres and also for colour identification purposes.

Another protective tape shortly to be introduced is a 0·003 in. thick aluminium-foil, coated on one side with heat-resistant adhesive which will prove useful as a heat-shielding tape. *Rotunda Ltd., Denton, Manchester.*

Multi-range meter

A ROBUST, high-sensitivity, multi-range meter designed to meet everyday working conditions yet relatively inexpensive has been added to their range by Taylor Electrical Instruments. Model 105a has a 5 in. scale graduated in three colours for easier range selection and incorporates the maker's rugged, centre-pole movement. The meter has 21 ranges including current readings from 60 microA to 12 A in six ranges, 0·3 to 1,200 V d.c. in 7 ranges, 12 V to 1,200 V a.c. in 5 ranges, and resistances in 3 ranges from 0 to 20 megohms. The meter can be supplied with a high voltage adaptor for reading up to 30 kV and a leather carrying case is also available. *Taylor Electrical Instruments Ltd., Montrose Ave, Slough, England.*

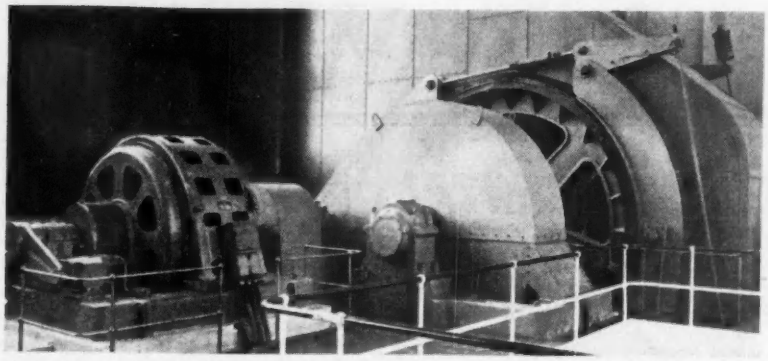


The new, moderately priced Taylor Instruments multi-range meter is claimed to have high sensitivity combined with rugged construction

Television relay cables

TWO television relay cables, developed to meet increasingly stringent requirements of v.h.f. relay systems, have recently been announced. Single and double screen cables, both available in five conductor sizes up to 0·104 in. dia. are claimed to have uniform impedance characteristics over the television bands. *Aerialite Ltd., Castle Wks, Stalybridge, Cheshire.*

Lea Hall colliery electrics



2,100 h.p. winding engine supplied by GEC for the downcast shaft at Lea Hall Colliery. This winder, and a similar one for the upcast shaft, is driven by an a.c. induction motor with a speed control system regulating rotor resistance and braking

THE recently opened Lea Hall Colliery (ELECTRICAL TIMES, 28 July), is notable for being the first colliery designed and engineered solely by the NCB and also because about 60% of its output will be fed directly to the adjacent 600 MW Rugeley power station now under construction.

The electrical winding engines and much of the auxiliary electrical equipment as well as coal and dirt handling plant has been supplied by the GEC on contracts totalling about £700,000.

Coal handling plant supplied includes conveyers, screens, feeders, crushers and a side-discharge tippler, involving the use of auxiliary motors with a total rating of nearly 1,600 h.p. Four transport systems are in use at the colliery. Coal from the shafts is taken to the wash plant by one conveyer system, while further conveyers feed the crushing and blending plant. Coal imported to the colliery is taken to a separate crushing plant, passing on the way through Witton Kramer 65 in. suspended magnetic separators. The fourth conveyer system handles dirt, conveying it to crushers and disposal bunkers.

Winding Engines

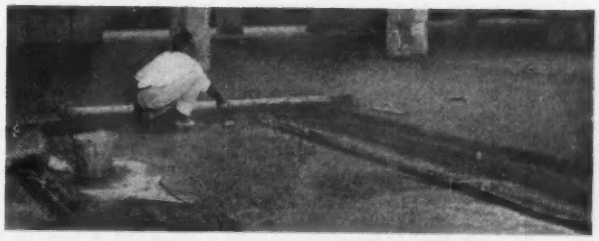
Largest items of electrical equipment in the colliery are the two 2,100 h.p. winding engines and their associated control gear. A further 1,500 h.p. engine is on order. The winder drums on the up- and down-cast shafts are of the double drum type with diameters of 16 ft. They are driven through 9·05:1 single-reduction gearing by the 2,100 h.p., 375 r.p.m., 3·3 kV slip-ring induction motors.

The winder control scheme embodies the GEC closed-loop system which ensures a close relationship between rope speed and the driver's lever position, while also including overriding torque control to prevent overloading if the driver's lever is moved rapidly.

Speed is controlled by variations in the rotor circuit resistance obtained by an oil servo motor actuated liquid resistor responding to the lever controlled speed reference. Depending on the cage load and position, retardation may be controlled automatically with the system by using d.c. injection braking on the stator winding, regenerative braking or plugging.

Open-plan office wiring

FORESIGHT in the planning of the (ELECTRICAL TIMES, 28 July) is office block built for F. W. Woolworth and Co. at the administrative centre for the Southern Area at London Rd, Norbury, has enabled an open floor plan to be adopted with all services for each desk—telephone, desk lights, accounting machines, etc.—fed from floor-based switch points. The main floor covers 19,000 sq ft and is occupied by about 300 staff. 184 pedestal outlets are located at selected positions on the floor, each fed through a Key pitch fibre underfloor duct system solidly embedded in the concrete underfloor. Over 4,000 ft of ducting, supplied by the Key Engineering Co., was laid by the main contractors and architects, Messrs Wates Ltd. The drawing in of the cables and the installation of the electrical equipment was carried out by Haines and Sheppard Ltd., of 1258 London Rd, Norbury. As the photograph clearly shows, the result is to give a clean and easily adjustable office desk layout without a confusion of electrical wires and cables hanging from the ceiling or festooned over the floor.



General view of the new Woolworth office with an outlet ringed. Above is the conduit being laid

News of the Week

HIRE-PURCHASE AND RENTAL IN THE NEWS

M-R Introduce "Packaged H.P." Plan

"A NEW approach to hire-purchase" is how Morphy-Richards describe their new "Blue Chip" hire-purchase scheme to be introduced this month in conjunction with Awley Finance Ltd., a member of the Lombard Banking Group. The scheme will enable customers to buy any combination of M-R appliances to the minimum cash value of £15 as a "packaged" h.p. transaction on one installation agreement—and cetain charges can be included.

Only one rate of interest will be charged on the complete agreement, and the interest can be as low as 7½% per annum. Awley will, of course, also finance h.p. on any single M-R appliance which retails above £15.

The Blue Chip scheme will be promoted during the autumn in a series of national Press advertisements. Full details of the scheme, together with leaflets and display material, will be available to interested dealers.

Commenting on the scheme, Mr C. F. Richards, M-R's joint managing director, said: "This new form of hire-purchase can give tremendous impetus to the sale of those smaller appliances which, mainly, have either been unobtainable on h.p. or available only separately at inflated rates of interest to make the agreement an economic proposition."

As an example of a typical agreement, M-R quote a "home heating" deal, including a radiant fire, convector heater and electric blanket, plus installation charge, totalling £24 3s 5d. This would require a deposit of £4 13s 5d plus 12 monthly instalments of £1 12s 6d.

Just how much installation work may be charged for under the scheme is being left largely to the common sense of the retailer. He will have to bear in mind that the essential purpose is to sell appliances, not wiring.

In conversation are the originator of the "Blue Chip" scheme, Mr E. Knight (Lombard Banking) and Mr C. F. Richards (Morphy-Richards)

Power Strike Prospects

ALTHOUGH as we go to press there are prospects of a meeting between Electricity Council officials and trade unions representatives to discuss a "comprehensive and complex" revision of pay structure, threats of strike action by the manual workers in the supply industry are still strong. Amongst developments in the situation has been a statement by one of the members of the three-man tribunal which earlier rejected (after failure to agree) a claim for a wage increase, that he had never adjudicated in a claim which was more than justified.

The situation as we go to press is that an unofficial shop stewards' organisation has called for a strike of workers in the manual grades to begin on Monday morning.

More Retail Outlets

WITH the aim of establishing a wide network of electrical retail shops, a new company, Senior Domestic Appliances Ltd., has just been formed with an initial capital of £10,000. Mr W. H. C. Payne, managing director, tells us arrangements have been made to open eight shops within the next nine months, but eventually it is hoped to have a network of about 250 shops throughout the country selling a wide range of domestic electrical appliances. Head office of the new concern is at Imperial Bldgs, Victoria Rd, Horley, Surrey.

New Relay Concern

AERIALITE LTD. and TWW Ltd., the commercial TV programme company for Wales and the West, have jointly formed a new concern, Wire Vision Ltd., with an initial capital of £50,000. Directors are Mr L. S. Hargreaves, chairman of Aerialite Ltd., and Mr A. E. Francis, managing director of TWW. The new concern is a finance company to back local aerial services and relay systems for TV or radio.

Hotpoint's appliance rental scheme . . .

A NEW rental scheme open to all Hotpoint dealers was introduced on August 2 by AEI-Hotpoint in conjunction with the Mercantile Credit Co. The plan calls for an initial deposit of 13 weeks' rent, and thereafter a weekly rental of 6s to 12s, depending on the type of washing machine or refrigerator required, is charged by the dealer. This reduces after three years to a nominal weekly figure to cover service costs.

Examples of how the scheme operates in practice are: "Princess" washing machine with wringer and heater—£5 7s 3d deposit, followed by 8s 3d a week rent for three years (making a total of £69 14s 3d, inclusive of all service, compared with the normal retail price of £49 7s); Model E50 refrigerator with table top—£7 16s deposit and three-year weekly rental of 12s.

At the end of the three-year period the consumer has a 13-week rent-free period. If the appliance is retained the consumer pays 2s a week for the next 12 months, and afterwards 1s 6d a week. All service, including the provision of spare parts, is free throughout the period of rental, and in addition an annual service maintenance call will be made.

AEI-Hotpoint are providing an explanatory leaflet to assist dealers and will supply rent books, rental agreement forms and advertising blocks to those joining the plan. Mercantile Credit Co. will additionally send a representative to explain the scheme to interested dealers.

. . . and Servis rental, too

DETAILS are also available of a new rental scheme being operated by Wilkins and Mitchell Ltd., makers of Servis washing machines. Although similar in outline to the Hotpoint scheme described above, it has the advantage, the makers claim, that the rental payments, though including the cost of contract maintenance by Servis engineers, do not carry interest on the maintenance charge.

This is collected by the h.p. company concerned (Charterhouse Credit) and paid over at six-monthly intervals, thus reducing the rent and the three-month initial deposit required under the regulations. Another feature of the scheme is that large retailers with their own rental schemes can include Servis contract maintenance in the rental charge.

* * *

We understand that Hoover and Ada (Halifax) Ltd. are among several appliance manufacturers about to introduce new rental and h.p. schemes.

Objection to Marchwood Fleet Line

OF 165 landowners affected by a 43-mile route of 132 kV line from Marchwood power station to Fleet, there is only one objector. His views were outlined at an inquiry, conducted by Mr W. L. N. French, of the Ministry of Power, when the CEGB sought compulsory powers to run the proposed line. It was stated that 3,860 ft of the route length would cross the land of the objector, Mr K. Gabler.

For the board, Mr R. P. E. Watson explained the alternative routes which had been investigated and rejected.

Retailing in June

DESPITE credit restrictions, sales by independent radio and electrical retailers during June were only 3% lower than in June, 1959; and for department stores an increase in sales of 1% was recorded, says the Board of Trade. Although these figures must be compared with a 4% increase for retail sales overall, they are markedly better than the 10% fall recorded for sales of all kinds of durable goods shops. The BoT judgment is that although retail trade generally continued brisk, there were signs that the underlying rate of increase might be slowing.

In the hire purchase field, sales of household goods were 19% lower than a year ago, compared with 3% down in May, and 14% up in April, but sales were particularly high in June, 1959, so some of the decrease should be discounted. What the BoT call "the downward drift" of h.p. business was smaller for hardware shops than for finance houses.

Battle for Morphy-Richards

BOARD OPPOSE E.M.I. TAKEOVER BID

STRONGLY opposing efforts of Electric and Musical Industries Ltd. to take over the Morphy-Richards business, the directors of the latter concern (with Mr D. Morphy abstaining) last week recommended their shareholders not to accept the EMI share-exchange offer. M-R chairman Mr F. Bishop announced that their total dividend will be not less than 25% for 1959-60, compared with the equivalent of 12½% last time. Profits, he added were £1·2 million for the year, against £675,000 last time. This reaction quickly followed the news that EMI held between 12% and 13% of the M-R share capital on the conclusion of the deal with Mr D. Morphy, a joint managing director, who has sold to them the major portion of the holdings of himself and his family (estimated to be about 10% of the company's total capital of 8,461,000 Ordinary 4s shares). Sale price of those shares has been put at around 21s each—realising some £900,000.

That holding was, in fact, the largest individual holding. According to the latest returns at Bush House, other major shareholders are Prudential Assurance (over 500,000), Pearl Assurance (250,000), Royal London Mutual (nearly 200,000), Church Commissioners (192,000) and Phoenix Assurance (nearly 140,000). What these think of the EMI's latest offer remains to be seen. EMI are offering a share exchange on the basis of two EMI 10s Ordinary for every three M-R 4s stock units.

It was also revealed last week that talks were initiated last May between the two companies "to explore any possible advantage of commercial collaboration," but these were discontinued some weeks ago.

The sale of Mr Morphy's holding was made without the prior knowledge or approval of the M-R board, and obviously displeased Mr C. F. Richards, the other joint managing director. It would seem that the end of their 24-year partnership is near.

The Morphy-Richards business was started in a disused oasthouse at St. Mary Cray in 1936, initially producing electric fires which, at 17s 6d, sold quickly. Irons were soon added and also achieved record sales.

It became a public company in 1947, after a period of association with A. Reyrolle and Co. Since the war, expansion has been considerable, with many new appliances introduced, and additional factories built in England and Scotland.

Hackbridge and S & C merger terms

TERMS of the proposed merger of Hackbridge and Hewittic Electric Co. Ltd. with Switchgear and Cowans Ltd. are now revealed. A holding company is to be formed with Ordinary capital in the 4s shares, which will be issued in exchange for those of the two companies on the basis of seven for every four Hackbridge 5s units, and two for every one S and C 5s share. It is anticipated that, subject to no unforeseen circumstances, the holding company will pay a 12½% dividend for the year to 31 March next, with an interim of 4% in December.

The terms of the merger will also provide for the exchange of Preference shares in Hackbridge and Hewittic for an equivalent number of Preference in the new holding company.

Fridge demand continues

DESPITE recent signs of redundancy and short-time working in the refrigeration industry, production of domestic refrigerators continued to show a healthy increase in June. Manufacturers' deliveries of British-made refrigerators in that month totalled 126,614 compared with 107,145 in June, 1959, according to the latest figures issued by DorDec. This represents an increase of 18%.

Deliveries of refrigerators to the export market increased by 40%, totalling 14,777 compared with 10,517 in the same month last year. Over the first six months of 1960 exports were 38% up on the same period of the previous year.

Home market deliveries during the first half of the year reached 653,444, an increase of 45% on the total of 449,181 for the same period of 1959.

MORE ACQUISITIONS

Rubber factory

FOR the Slough factory of St. Helens Cable and Rubber Co., the rubber manufacturing plant and the goodwill of their industrial rubber trade, P. B. Cow and Co. paid over £200,000 to British Insulated Callender's Cables Ltd., it is now revealed. In the deal, now concluded, P. B. Cow paid BICC some £90,000 in cash plus 300,000 4s Ordinary shares valued at 8s 1d each. BICC does not intend to offer any of the shares for immediate sale, it is stated.

Contractors

THE Electrical Contracting Department of J. S. Smith Ltd., of Nottingham, has been acquired by Hardwick Industries Ltd. The business has been amalgamated with the Electrical Engineering Department of another subsidiary, John Jardine Ltd., of New Basford, and together will operate as Jardine and Smith (Electrical Engineers) Ltd., with a registered office at Chelsea St, New Basford, Nottingham. Mr H. Twemlow and Mr B. O. Knott, the directors and joint general managers of the new company, are referred to on page 208.

Compressor firm

G. AND J. WEIR LTD., manufacturers of compressors for marine and specialised industrial applications, have acquired the compressor business of Alley and MacLellan (Polmadie) Ltd. Production of Alley units will be transferred from Polmadie to Weir's Cathcart Works, and the majority of the Alley and MacLellan sales, technical and design staff will be absorbed into the Weir organisation. The existing Alley Sales and service organisation in the UK will continue to operate through the head and branch offices of G. and J. Weir Ltd.

Distributors

HALSEY'S Electric Co. Ltd., the electrical wholesalers, have purchased all the issued share capital of Ellis & Mort Ltd., of Brighton, who operate in the south of England as distributors of electrical equipment, radio and television. Halsey's chairman is Mr R. G. Brandon, who was formerly with BTH and Hotpoint, until his retirement from AEI in 1956. Managing Director of Ellis and Mort is now Mr E. Brandon.

Board Wins Line Damage Claim

IF an Electricity Board gets permission to erect a bracket on a chimney from which to run a line to serve another consumer, who should pay for damage to the chimney when a tree is blown down across the line? That was the basis of a claim at Liskeard County Court recently. Mr W. E. Combellack, of Lostwithiel, told the court that he signed an agreement permitting the South Western Electricity Board to put up cable which, at one end was suspended from a bracket on the cottage chimney of his farm. During a storm in November an elm tree was uprooted and tore down the cables, which in turn dislodged the chimney. It had cost him £22 to have the chimney repaired and he claimed that sum from the Board.

Dismissing the claim, Judge H. R. B. Shepherd said the claimant did not hold the board in default—or himself; he put it down to a pure accident. The claimant was saying that he was not responsible for it, but that as the board had put up the cable for its own benefit they should pay. But he could not see how, by running a cable tied to a chimney or so near the trees, the board could be held to blame. He was unable to find that the board had done anything in the way of default or injury in this case, "The damage was caused in an exceptional gale, and the loss must fall where it comes," he said. The judge also expressed sympathy with the claimant.

LATEST ORDERS

J. G. STATTER AND CO. LTD. is to supply 24 switchboards to the Jordan Jerusalem District Electricity Co. The order was placed through Kennedy and Donkin, consulting engineers. The switchboards are destined for a number of substations in Jordan; one of these controls the supply to the industrial area of Bethlehem; another is at Gethsemane.

BRUSH Electrical Engineering Co. have received an order for a further batch of 46 diesel-electric locomotives for British Railways.

ROSS, COURTNEY AND CO. LTD. announce that their input of orders has risen by nearly 25% compared with the corresponding period last year. Premises are being expanded by about 15,000 sq ft.

HONEYWELL Controls Ltd. have obtained a £200,000 order for instrumentation for a Russian chemical works. It includes a 100 ft semi-graphic control panel containing full-size electronic and miniature pneumatic instruments for controlling temperature, liquid level, pressure and flow. There will be 70 temperature control loops, 30 level, 30 differential pressure and 50 flow and blending loops. Honeywell Controls are being assisted by their German and Italian associates in this project, but most of the equipment will be made at Newhouse, Lanarkshire.

India's Auto-Lighthouse

EQUIPMENT for India's first fully automatic all-electric lighthouse, designed to operate unattended for periods of six weeks, has been successfully tested at the Crawley Works of Stone-Chance Ltd.

The 24,000 candelas (red) eight-panel revolving lens rotates on a mercury bath pedestal and is driven by duplicate electric rewind motors, one acting as standby to the other. Control switchgear is housed in a cubicle together with two electrically wound time clocks operating in parallel. When the lamp is switched off at sunrise one of the duplicate generating sets starts up automatically to recharge the battery.

The lighthouse will have a visible range in clear weather of 24½ nautical miles.

Difficulties in Coal Distribution

ALTHOUGH the NCB last winter had plenty of coal in all industrial grades, it was not always able to distribute it to the customers who needed it. This is stated in the annual report for the year ended 30 June, 1960, of the Industrial Coal Consumers' Council. But it is not the NCB that has been remiss in this respect. Movement difficulties on the railways during Nov. and Jan. set the limit. The report adds that the general position was relieved by temporary transfers from rail to road of coal for some power stations.

As recently as Oct., 1958, the CEGB reached an agreement with the BTC that increased proportions of the coal for power stations should be carried by rail. At the time, it was stated that a considerable proportion would continue to go by road. The council remark that the public utilities, unlike many other industrial consumers, take their supplies evenly throughout the year "without any direct financial incentive."

Chiropodist attacks floor-warming

FLOOR-WARMING is attacked as a cause of sore and aching feet in the July issue of *Chiropody Review*, the official organ of the Institute of Chiropodists. An article by a Mr S. Pitts makes the following allegations:

> "Many modern buildings, including shops and offices, are having floor-heating installed, with the result that those employed in them have their feet submerged in a layer of warm and sometimes hot air. . . . Very few persons get away without some deleterious effect upon their feet. . . . The chiropodist is called upon to treat the reddened areas of feet which, to put it truthfully, are being subjected to a process which is little short of cooking."

The article, which nowhere quotes specific case-histories of troubles traced to effects of floor-warming systems, concludes with a call for "a public health inquiry at the topmost level."

From the earliest advocacy of electric floor-warming, the industry has given attention to the possibility of trouble with the feet of occupants of floor-warmed premises. In fact, all the evidence appears to have been the other way. Dr Bedford, the authority on comfort in connection with heating, has been quoted as reporting on schools warmed by heated floors, that with a maximum surface temperature of 78°F, no ill-effects to the feet will ensue.

Pipelines buried on the sea floor are detected by the Shell "Fish" when they enter its magnetic field. The detector is housed in a 6 ft long brass hull weighing 200 lb, which is dragged along the sea bed. Distortion of the magnetic field by a pipe enables it to be located within a few inches. In our picture, an engineer is checking the detector, and two technicians are preparing the recording chart. The "Fish" was devised by Shell Development Co., USA, and has proved valuable for locating undersea oil pipelines accurately; may have cable applications

New A.E.I. Office

AEI's Midland Regional office has moved into one building in Birmingham. The new address is Associated Electrical Industries Ltd., Gloucester House, 65 Smallbrook, Ringway, Birmingham 5. (telephone Midland 6335 and 9551). Special sales offices of AEI Birlec Ltd., AEI Lamp and Lighting Co. Ltd., AEI Sound Equipment Ltd., the Cable Division, Radio and Electronic Components Division, and Telecommunications Division, as well as Siemens Ediswan Lamps and Lighting, the X-ray service department and the construction and erection departments are remaining at their present addresses.

£1,000 Dealer Display Contest

A £1,000 prize display competition for retailers and electricity boards is part of the "Sweet Dreams" competition to be featured by Easipower Appliances Ltd. in their biggest publicity programme for the "Dreamland" electric blankets. The competition will run for 22 weeks, starting 19 Sept., and ten prizes are to be awarded each week to purchasers of a blanket. In the display competition, in which retailers must submit photographs by 28 Feb., the prizes are £350, £200 and £100 holidays.

Prizes to the value of £540 are also being offered by H. Frost and Co. Ltd. in a "Sunhouse" window display competition during October and November. The competition is to be held in the London and Midlands areas, to coincide with an extensive Press and TV campaign. Entry forms are obtainable from the firm at Fieldgate, Walsall, and must be returned by 20 Sept.

Switchgear accident

THE verdict of accidental death was recorded last week at the inquest on Mr G. Herridge, a control room engineer at Bowater's Pulp and Paper Mills. Mr Herridge was killed when he fell from a ladder on to 6·6 kV switchgear. Evidence at the inquest indicated that Mr Herridge had been cleaning switchgear cubicles. The one in which the accident happened was open for a visual inspection but was not intended to be cleaned. The victim should have obtained permission before he went into the cubicle.

Formal switch-over from d.c. to a.c. at Lowestoft (referred to last week). Major G. A. Bruce switches off the last rotary converter. On his right is Mr J. H. Aldous, Lowestoft service manager, Mr C. N. Bancroft, Yarmouth district manager, and Ald J. H. Stebbings

Sorry for the inconvenience, but . . .

"WE are sorry for the inconvenience, but this is due to the call for more electricity in Kingston." This notice-board is currently being displayed at the site of trenching and excavating for cable laying in the Kingston area, where the CEGB and British Insulated Callender's Constructon Co. are currently engaged in reinforcing power supplies at a cost of £75,000 a mile.

Courtesy to local residents who might be inconvenienced by the cable laying is the keynote of the project, which will cost £525,000. Already residents have received apologetic letters giving warning that contractors would be "tearing up the streets in front of their homes." So far it is reported that the residents have been "largely tolerant."

The cables are of the 132 kV oil-filled type, each rated at over 120 MW. One cable is sheathed with corrugated seamless aluminium with an outer protection of p.v.c. The other has a reinforced lead sheath incased in rubber and hessian.

A second project to lay underground cable from Kingston power station to Chessington is due to start next winter or spring.

£320,000 York reinforcement scheme

WORK is about to start on a £320,000 scheme to improve power supplies in the York area. It involves laying over six miles of underground cable, modifications to 11 substations, the installation of five new ones and of 33 new transformers. News of the work was given locally recently by Mr B. Calvert, sub-area engineer of the North Eastern Electricity Board. He explained that along with the board's work, the CEGB is to increase the capacity of the bulk supply transformers, together with generating plant at Foss Islands, from 90 MVA to 135 MVA. In the immediate future the CEGB is to install a third large transformer at Melrosegate.

Hands available

WHEN the South of Scotland EB advertised for 25 labourers for cable-laying work recently, between 500 and 600 men answered the advertisement, and formed queues in Glasgow to seek employment.

Cross-channel job

THE 2,700 ton collier *Dame Caroline Haslett* is shortly to be withdrawn from its regular trip by the CEGB to undertake the temporary role of a cable-laying ship. It is to lay part of the cross-Channel cable between Britain and France.

OFFICIAL PUBLICATIONS

Atomic Energy and Radio-active Substances. SI, No. 1,255, HMSO, 3d. Extends Nuclear (Licensing and Insurance) Act to manufacture of enriched uranium fuel elements.

Cable and Wireless Ltd. Accounts for year to 31 March, 1960. HMSO, 1s 6d.

National Certificates and Diplomas in Electrical Engineering—arrangements and conditions. Ministry of Education. Rules 127. HMSO, 6d.

First Aid (Revocation) Regulations, 1960. Draft. Deal with first-aid boxes in factories. HMSO, 3d.

Building Research, 1959. HMSO, 7s. (See page 211.)

BS 3253:1960. Phenol-resin bonded asbestos-paper sheets for electrical insulation at power frequencies. 6s.

Strategic Goods (Control) (Amendment) Order, 1960, No. 1325, HMSO, 6d. (See page 221.)

1960 B.A. Programme

FULL details are now available of arrangements for the 1960 meeting of the British Association for the Advancement of Science, due to be held at Cardiff from 31 Aug. to 7 Sept. The president of the Association, Sir George Thomson, will deliver his presidential address on the evening of Wednesday, 31 Aug., with the title "The Two Aspects of Science." The section G (engineering) address by Sir Alfred Pugsley (Professor of Civil Engineering, Bristol University) will deal with "Statics and the Engineer."

Amongst papers of potential interest to electrical engineers are those dealing with heat rates, creep in steels, thermo-electric refrigeration and the industrial application of silicones, and with the detection of non-radio-active materials by nuclear methods. There is to be a series of papers on recent roles of universities, colleges of advanced technology and research institutes in promoting the education of scientists and papers deal with continuous casting. One of the named lectures to be delivered during the week, the Kelvin lecture, will be given by Dr M. P. Reece, of the ERA, on the physical principles of switches and circuit-breakers.

Further information about the meeting is available from the Secretary, British Association, 18 Adam St, W.C.2.

Scottish Board mergers opposed

LOCAL authorities in Scotland have been commenting on reports that there might be a move for amalgamation of the two Scottish electricity boards. Inverness Town Council, at a special meeting recently, indicated its unanimous opposition to depriving the Hydro Board of its independence, and Sutherland County Council have asked the Secretary of State for Scotland about the rumour of amalgamation, at the same time protesting strongly against any such move.

Rotted pole caused linesman's death

THERE should be an improved test for proving the quality of wooden electricity poles, the jury suggested at a Brecon inquest recently. The inquest was on Mr E. H. Bartlett who died in hospital from injuries received when he fell from a pole. Bartlett had been dismantling wires and removing conductors from the pole and, on completing the job, began to unfasten his belt. At that moment a chargehand linesman with the South Wales Electricity Board, Mr J. Morrow, heard a cracking noise and the pole began to move out of position, it was stated. He shouted to Bartlett to jump, but the latter seemed unable to get his belt undone. After the pole fell, Bartlett lay obliquely across it.

At the inquest, Morrow said he tested the pole in the usual method—with a 2 lb hammer, tapping the pole all the way round and as far as he could reach. He concluded the pole was very good and safe to climb. Bartlett climbed the 19 ft pole, testing on the way, and after reaching the top called out indicating that it was "all right."

A Brecon forestry expert, Major J. D. D. Evans, said he carried out three tests of the pole using a Pressler borer. Above ground level the pole was sound but slightly moist. He maintained that the method used by the board did not ensure that there was no decay below or close to the ground. He considered some form of test should be used below ground level.

Mr C. E. J. Wilde, Brecon district engineer to the board, said the normal practices of testing a pole were the hammer test and the prodding test. There was no evidence to show that the pole in question was rotten. That could only have been detected if it had been tested below ground. The pole was 15 years old, whereas the normal life of a pole was 25 to 30 years.

The jury returned a verdict of accidental death.

Lighting at Sheffield

IMPLEMENTATION of the policy of relighting bus routes by 60 W sodium lamps and replacing existing side-street lighting by 45 W sodium lamps has been the major task for the City of Sheffield Lighting Department during the year ended 31 March last. This is made clear in the report of the lighting engineer, Mr J. Woodhouse. During the year 695 new lamps were installed replacing 629 gas or filament lamps. Mr Woodhouse comments that the improvement in lighting accentuated the need for converting existing gas lamps as quickly as possible. He remarks later in his report on continued trouble with malicious damage to lamps, which involved 4,934 filament lamps and 51 sodium lamps broken during the year as well as 529 electric lamps stolen.

During the year the department took 9·26 million units of electricity, an increase of 1·04 million on the previous year.

More outside reading

THE North Western Electricity Board is to encourage builders to provide a small compartment in new houses where electricity meters can be read from outside. The present type of credit meter would be installed facing the outside of the building and protected by a glass panel. The board has no intention of putting slot-meters where they can be reached from outside the house. The area consultative council have been told that nothing would be done to move the meters in existing houses to positions from which they can be read from outside unless housewives want it and are prepared to pay for it.

Douglas (I.O.M.) Results

A FURTHER increase in average consumption per consumer is recorded in the annual report of Mr C. Anderson, borough electrical engineer and manager of Douglas, I.o.M. For the year ended 31 March last the figure is 2,875 units, compared with 2,707 for the previous year. Plant capacity at the end of the period amounted to 13,150 kW and the maximum load reached 10,000 kW, but two 2,200 kW diesel generators have been installed to operate in conjunction with the steam plant. The corporation still has an agreement with the Isle of Man Electricity Board for exchanges of power. Operations for the year resulted in a credit balance of £2,602 from a total revenue of £336,000.

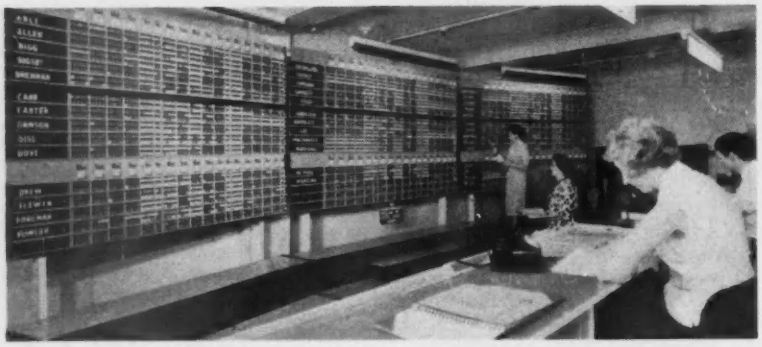
Turnover analysed

ALTHOUGH shops with a low turnover account for a high proportion of the shops in most kinds of business, electrical and radio dealers are among the few where shops having a turnover of more than £10,000 a year were more numerous than those with a lower turnover according to the BoT, based on 1957 figures.

Some 54% of electrical and radio shops have a turnover of more than £10,000, compared with 35% of all retail shops. Of the 46% of electrical shops showing less than £10,000 turnover, 19% exceed £5,000. This compares with 65% and 27%, respectively, in the case of all retail shops generally. Department stores take the lead with 92% showing an annual turnover in excess of £100,000.

SERVICE BY APPOINTMENT

ELECTROLUX LTD. have evolved a new system of dealing with servicing calls which allows each request to be met with a definite, on-the-spot arrangement. The new procedure, already in operation in London, will soon be incorporated into all the company's 15 sales/service offices covering the country. In each control room, charts made up of rotating cubes with faces of four colours show the exact work load position of every service representative within the region for a month ahead.



Control room of Electrolux's London service department, 419 Oxford St, showing the master charts on which are plotted the hour-by-hour work load positions of every representative in the region. The receptionists on the right arrange appointments on-the-spot while the plotter adjusts the board accordingly.

The service department receptionists, having discovered the inquirers' addresses, know at a glance who the nearest service reps. are and how soon they can deal with the problems. On the chart each man's day is divided into ten possible calls, using the appropriate coloured sides of the cubes to indicate where his allotment comprises appointments for set or indefinite times. At the same time, if his quota is full whilst a neighbouring colleague has little to do, this position is apparent to the control room staff and the men can be deployed accordingly.

Mr F. C. Reeve, Electrolux's service manager, who originated the idea, says that already the new system has proved its worth. "We have found," he told ET, "that people are less likely to haggle over delays if they are given a definite appointment. 'Next Saturday at 10.30' is much more effective than 'as soon as possible'."

TIED TO INDUSTRY

RIST'S

RIST'S WIRES & CABLES LTD

LOWER MILEHOUSE LANE · NEWCASTLE · STAFFS

Sole London Distributors: LYMELIGHT ELECTRICAL INDUSTRIES LTD.

130/4 PENTONVILLE ROAD, LONDON, N.1. TELEPHONE: TERminus 9631/2

Mutac Clipper switches have been accepted by the Council of Industrial Design for Design Index—so architects, consulting engineers and contractors are choosing them for their good looks, as well as for their functional efficiency and easy assembly.

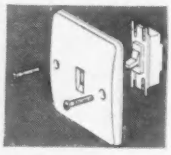
just a minute!

that's all it takes to instal the new

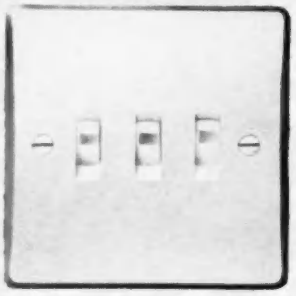
'MUTAC CLIPPER'

ARCHITRAVE SWITCH ASSEMBLY

Take either a 'Mutac Clipper' plaster depth or architrave switch plate and select the required switch, bell push or pilot light. Simply press home the spring clip with a small screwdriver and a fixed plate assembly is ready for installation. Available in 1, 2 or 3 gang for plaster depth and 1 and 2 gang for architrave. 'Mutac Clipper' switch assemblies will cut installation costs and save time as additions and alterations can be made with the minimum of effort.



PLASTER DEPTH SWITCH ASSEMBLY



G.E.C. INSTALLATION EQUIPMENT GROUP

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

SWITCH AND FUSE GEAR
H.R.C. FUSES
OVERHEAD BUSBARS
RISING MAINS
CONDUIT
PIRELLI GENERAL CABLE
CABLE TRUNKING
UNDER-FLOOR CABLE DUCTS
ELECTRIC WIRING ACCESSORIES
BELLS

Electrical Heating for Swimming-baths

PLANS of the Ecclesfield Parish Council, Yorks, for electrical water heating in their £80,000 swimming-baths at Chapeltown, have now been approved "with some reluctance" by the Minister of Housing and Local Government. The Minister has granted permission after hearing the council's reasons for switching from the previous agreement to use coal-fired boilers. The council apologised for not informing the Minister of their change of policy.

The new covered swimming-baths, expected to be completed next August, are being built on the fringe of a smoke control area.

In his letter to the council the Minister said it seemed that in general the advantage of electrical heating did not compensate the higher running costs. A coal-fired system would be preferable, but as the matter had been given careful consideration by the council he had agreed, with some reluctance, to allow them to go ahead with electrical heating. The Coal Board had been in touch with the Ministry on the matter but they did not object to the use of electricity to heat the water. Their only objection would have been to the use of oil—which the council never considered.

E.I.B.A. GOLF

NATIONAL Final Meeting of the Electrical Industries' Golf Championship will be held at Little Aston and Sutton Coldfield golf courses on 26 Sept. The annual dinner will take place at Penns Hall Hotel, Walmley, Sutton Coldfield, in the evening. For tickets, apply to Mr A. R. A. Wood, 100 Aston Rd. Birmingham 6.

Sayings OF THE WEEK

"We could have bought Metal Industries and Lancashire Dynamos if we had wanted to at the time, but we didn't." . . . SIR JOSEPH LOCKWOOD, chairman, Electric and Musical Industries, talk on past takeover bids.

"If the coal trade wants to retain its customers, it must do its best to provide what they want, when they want it." . . . From report of Domestic Coal Consumers' Council.

"The general attitude towards electrical floor-warming systems was certainly as favourable as that towards central heating . . . floor-warming with some provision for radiant topping-up can provide a very comfortable environment compared with that obtained with some central-heating radiator systems." . . . Report of the Director of Building Research for 1959.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, August 9

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	250½	−3
" (3 months)	247½	−1
LEAD, refined pig, 99·97% purity (cash)	70½	−1½
" (3 months)	70⅝	−⅜
TIN, refined, min. 99·75% purity (settlement)	806½	−7½
(3 months)	807⅜	−7½
ALUMINIUM, ingots 99-99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	218½	—
SILVER (Troy oz)	79½d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	88½	+½
" (3 months)	88¼	+⅜
RUBBER, per lb.		
No. 1, R.S.S. spot	30½d	−⅛d
c.i.f. basis, ports, Oct.	30½d	−⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	33c	—
Lead (New York)	12c	—

* Tape Price, now an average, includes varnishing

Power reconnected: no fraud

A MAN who reconnected the electricity supply in his house after it had been cut off for non-payment of arrears was last week acquitted of a charge of fraudulently consuming electricity, but found guilty of laying wires to the electricity main.

The man, James Sargeant, of Bracknell, owed the Southern Electricity Board money in respect of electricity consumed at another address, it was stated at Wokingham Magistrates' Court. As the arrears were not paid the supply was cut off on 23 June last year. A meter reader called at the house on 27 June and found that the supply had been reconnected. It was cut off again next day. When a policeman called to see Sargeant on 23 Feb., he noticed that the supply had again been reconnected.

Sargeant was alleged to have said: "It was not my intention to defraud the board otherwise I would have bypassed the meter." He had reconnected the supply on the first occasion so that his wife could cook a lunch, and the second time because one of his children had injured a foot and might have fallen down the stairs in the dark.

The chairman, giving Sergeant a conditional discharge, said: "No evidence has been given that you had any intention of consuming electricity fraudulently. Everything you consumed went through the meter."

Soviet-Sino Trade Embargo Changes

MERCHANTING changes coming into force on 22 Aug. affecting goods on the strategic embargo list are given in the Strategic Goods (Control) (Amendment) Order 1960 (S.I. 1960, No. 1,325), obtainable from H.M. Stationery Office, Kingsway.

The changes are substantially those published in the Board of Trade Journal embargo list for 5 Feb. Control is removed from certain types of photomultiplier tubes, chemical compounds and machine tools. It is imposed on certain electric vacuum furnaces, electronic assemblies and other items. Amendments are made to controls for telemetering and telecontrol apparatus, and several electronic components and chemical compounds.

S. of S. E.B. Sites

REPRESENTATIVES of the South of Scotland EB are reported to have been examining sites along the coast between Grangemouth and North Berwick to find a suitable location for a large power station. Earlier statements have indicated that a coal-fired station with 200 or 300 MW sets might be located in this area, for commissioning subsequent to 1966.

News in Brief

Annual dinner of the IEE East Midlands Centre will be held on 16 Nov. at Victoria Station Hotel, Nottingham.

Annual golf tournament of the EIBA (West of Scotland branch) will be held at Cardross Golf Club on 8 Sept.

Regulations about First Aid Boxes in factories are revoked by a Statutory Instrument published by the Ministry of Labour. They have been rendered unnecessary by SI 1959, 906 published last year.

Board of Trade Notice to Importers No. 951 consolidates various amendments to open general licence from imports with particular reference to Japan.

The Minister of Transport is proposing to make regulations which will require notification of all road-transported loads over 40 ft long to the police, and will give the Ministry control of loads over 80 ft long.

Company Activities

SO now it's the turn of that old market favourite, Morphy-Richards! Electric and Musical Industries, unsuccessful in their takeover bids for Lancashire Dynamo Holdings and Henry Simon, is now known to have bought 10% of the M-R equity from Mr D. Morphy for £1·1 million and has acquired further shares up to about 15%. A share exchange is announced of two EMI 10s ordinary shares, worth around 47s 3d each, for every three 4s ordinary shares in M-R. That makes "Emmies" offer worth some 31s 6d for every M-R share against 30s 4d in the market. What do Morphy-Richards shareholders do? They, who never had it so good, sit tight for the time being. And he who tells them so is he who pointed out their investment merits in this column early last year when they were then at the equivalent price of 9s 6d.

EMI's offer, however, is attractive and deserves to succeed. Before it was known that Mr Morphy had sold most of his M-R shares, they were a quiet market at around 21s 9d. On the offer terms, up they rocketed to 32s 6d before easing back to 30s 4d. So here was a 8s 7d rise within the short space of a holiday-shortened week! Again, when reviewed from the dividend income, M-R holders will do better than the 25% dividend promised by M-R. In his "reject-the-offer" counter statement M-R's chairman, Mr F. Bishop, estimates the company's net profits to the end of June, 1960, at £1·2 million against £675,000 in the previous year; he says he intends to pay not less than 25%—effectively twice the amount paid last year. But as EMI now say that they intend to pay 17½% on their own 10s shares they are in effect offering M-R holders a fraction more than 29% on their 4s ordinary. Even if EMI are proved third time unlucky, I cannot see M-R shares dropping back drastically. At 30s 4½d, with a 25% dividend, the shares would still be yielding 3·3%, considerably more than the 2·3% yield before any "hard" hint of takeover hit the market. And from the trading account for the year just ended and the forecast given by Mr Bishop, investors are only too likely to carry on buying on this 3·3% basis, the price holding at around 30s.

Less happy, however, for the moment, is the state of Hoover, who have not escaped a heavy hammering at the hands of the "squeeze." Before-tax profits for the six months to 30 June have tumbled to £4,013,000 from £5,650,000 in the corresponding period last year—a 29% fall. Sales in the home market for the first six months were 13½% lower but for May and June, taking the full brunt of the ex-Chancellor's credit and hire-purchase restrictions, sales were cut down by 35% compared with last year. Nonetheless, the interim dividend on the 5s ordinary and "A" ordinary has been maintained at 3d a share and despite the present thunderclouds overshadowing the washing machine market, chairman Mr H. Hoover stresses that the company is continuing as vigorously as ever their long-term plans of development in both home and overseas markets. And so the company's "A" ordinary after opening the week at 40s 3d, dipped to 38s and later recovered, to finish the week at a not too unhappy 40s 4½d.—*From our City Correspondent.*

Ada (Halifax)

With a fall in trading profits from £351,117 to £207,166, no final dividend is to be paid for the year ending 31 March. The interim had been maintained at 10% on increased capital and the board considered that on the results alone a final dividend of 5% would have been justified. However, in view of the drastic effect of controls on trading and of the difficulty of foreseeing the future, it was felt essential to conserve the company's resources.

Cable and Wireless Ltd.

Profit for the year to 31 March last is £3,432,545, an increase of £65,564. The current financial year has started favourably and apart from unforeseen developments, results are expected to be equally satisfactory, the directors report. To ensure that the development of the Commonwealth telephone cable system goes forward with all speed, and to meet other requirements, it has been decided to build a cable-laying ship of over 7,000 tons. The specification for the vessel is almost complete and will be put out to tender very shortly.

Dubilier Condenser Co. (1925) Ltd.

The volume of production and value of sales both increased in the past year, but with highly competitive conditions some products were sold at uneconomic prices, Mr F. H. McCrea, the chairman, reports. Shortage of labour has hindered the Acton factory, and it has been decided to extend the Kirby factory for the manufacture of new types of capacitors. Production and sales for the first three months of the current year and the value of outstanding orders are at a higher level than a year ago, he adds.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1956	412,030	178,004	139	30	5/11	3/6
1957	390,005	159,908	124	30*	5/5	2/11
1958	309,594	115,315	59	20	4/4	3/-
1959	290,916	124,376	60	25	5/9	3/3
1960	352,721	153,777	74.6	30†	6/10	5/-

* Plus 50% capital bonus.
† Plus 100% capital bonus.

East African Power and Light

Units generated in Kenya during the year ended 31 Dec., 1959, amounted to 334·8 million, compared with 297·3 million in 1958, Mr A. J. Don Small, the chairman, reports. Sales to consumers rose by 13·05% to 295·8 millions. In Tanganyika, electricity sales, excluding bulk supply for Mombasa, were 102·1 million units. The Nyeri electricity undertaking in Kenya, previously operated under licences held by the Director of Trade and Supplies, was acquired on 1 Jan., 1960. This has an area of supply of 170 sq miles, a hydro-electric plant completed in 1956 with two 500 kW sets and provision for a third (which it is proposed to install), plus a 500 kW oil engine set. For the undertaking the company paid £50,000 cash plus £50,000 in 7% Preference shares and £150,000 Ordinary stock, in addition to £21,000 cash for stores, etc. It is proposed to proceed with the Seven Forks scheme, but the disturbed state of Africa has denied to Power Securities Corporation Ltd. any opportunity of raising the money in the market. Accordingly an approach has been made to the International Bank. Mr Small also considers that the serious depression in the market value of their holdings is entirely unrelated to their intrinsic asset value.

Hoover Ltd.

In view of the recent cuts in production staff, the sharp reduction in group profit for the first six months of this year is not unexpected. The total dropped by over £1,600,000 to £4,013,000. After estimated tax and minority interests, the balance is £1,960,000 (*£2,553,000*). Interim dividend is 3d per 5s share on capital doubled by a scrip issue. Although profit for the first four months of the year was substantial, the months of May and June were markedly affected by h.p. restrictions, the directors point out. Home market turnover for the first six months was 13½% down, but for May and June only it was 35% down, compared with last year. One bright spot is that exports are up 36% on last year. In view of the general indications, the board does not anticipate any appreciable improvement in the position.

Pye Ltd.

Group turnover in the year ended 31 March last topped £25 million, and will rise still further in the current year with the acquisition of Telephone Manufacturing Co. Trading profit for the period was £3,927,041 (*£2,834,841*).

Intended Dividend

Sun Electrical Co. Interim 5% (2½%).

London Electrical and General Trust. Final 12% making 18% total for year to 30 June last.

Nigerian ES Corp. final 6% making 10% (8%) plus 4% dividend equalisation distribution.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

12 Aug.—Manchester C.C. Electrical installation in Whalley Range High School.—See 4 Aug. issue.

12 Aug.—Redcar B.C. Erection of Stanton columns and E.L.E. Co./G.E.C./Siemens-Edison Swan Lanterns for 1960-61 programme.—See 28 July issue.

12 Aug.—Spenborough B.C. Electrical work in proposed Market Arcade, Albion St, Cleckheaton.—See 28 July issue.

12 Aug.—Ulster Transport Authority. Supply of (Contract 65) batteries and battery plates; (Contract 77) accessories, adaptors, plugs and switches; (Contract 78) Empire Cloth, p.v.c. and cotton sleeving for year from 1 Oct., 1960.—See 21 July issue.

12 Aug.—West Riding C.C. (b) Electrical installation renewal in Fire Service H.Q., Oakroyd Hall, Birkenshaw.—See 4 Aug. issue.

13 Aug.—Lanark C.C. Electrical work in erection of libraries at Newmains and New Stevenson. Applications to County Architect, D. G. Bannerman, 34 Albert St, Motherwell, by above date.

15 Aug.—Carlisle C.C. Electrical installations in 50 dwellings, Morton.—See 4 Aug. issue.

15 Aug.—Croydon C.B. Rewiring of West Thornton School, Boston Rd. Borough Engineer, Town Hall.

15 Aug.—East Ham C.B. Supply and erection of (1) lighting columns, (2) street lighting equipment comprising 35 15 ft concrete and one 25 ft steel column together with lanterns, lamps and ancillary gear.—See 28 July issue.

15 Aug.—Wick T.C. Electrical work in erection of 92 houses in Willowbank sixteenth development.—See 21 July issue.

16 Aug.—Chesterton R.D.C. (a) Supply and erection of 260 15 ft concrete columns with 60 W sodium lamps/lanterns; (b) supply and erection of 95 15 ft columns with 100 W tungsten lamps/lanterns; (c) conversion of 320 c.i. gas columns for use with 100 W tungsten units; (d) dismantling of existing gas installation.—See 28 July issue.

16 Aug.—Islington B.C. Design, provision and installation of floodlighting at Market Rd Playground.—Advertised 14 July issue.

16 Aug.—Lichfield C.C. Supply and installation of 26 Group "B" concrete columns with sodium lanterns/ancillary equipment and dismantling and re-erection of six c.i. columns along Weston Rd, Curborough Rd, etc.—Advertised 28 July issue.

17 Aug.—Stoke-on-Trent C.C. Supply of Group "B" equipment: (a) 1,000 post top lanterns; (b) 1,000 metal columns; (c) 250 80 W chokes; (d) 250 80 W m.v. capacitors; (e) 1,000 15 A plug-in synchronous time switches. City Engineer and Surveyor, Town Hall.

18 Aug.—Cookstown. Electrical installation in hostel and extension at Loughry Agricultural for M. of Finance.—See 21 July issue.

18 Aug.—Plymouth C.C. Lighting installation improvements, by registered contractors, at City Abattoir, Prince Rock. City Engineer and Surveyor, J. Ackroyd, The Guildhall. Deposit £3 3s.

18 Aug.—Sittingbourne and Milton U.D.C. Supply and/or erection of 112 Group "B" and eight Group "A" concrete columns with 80 and 250 W m.v. lighting.—See 4 Aug. issue.

19 Aug.—Belfast. Electrical installation in meals kitchen at Christian Brothers' Voluntary Secondary Intermediate School For Boys, Glen Rd. Details from Architect, D. J. MacRandal, 17 Malone Rd, Belfast. Deposit £3 3s.

19 Aug.—Coquet Water Board. Lighting, heating and power installations at new filtration works and pumping station at Warkworth.—See 4 Aug. issue.

19 Aug.—Down C.C. Supply and installation of lift at St. Leonard's Rehabilitation Centre, Warrenpoint. County Planning Officer, English St, Downpatrick.

19 Aug.—Dunfermline T.C. Electrical work separate trades tender in erection of 27 cottages/flats at Park Rd West, Rosyth. Burgh Architect, 6 Abbot St. Applications by above date.

19 Aug.—Manchester C.C. Electrical installation in workshop at Heaton Park.—See 4 Aug. issue.

19 Aug.—Pocklington R.D.C. Contract 2. Supply and erection at Melbourne of four 50 g.p.m. sewage ejectors complete with motors, starters and accessories.—See 28 July issue.

20 Aug.—Bournemouth C.B. Provision and erection of two 260 kW dual fuel alternator sets and associated switchgear for contract 3, Holdenhurst Sewage Disposal Works.—See 28 July issue.

20 Aug.—Dunbarton C.C. Provision, erection and wiring of 126 lighting columns in Vale of Leven and Renton Special Lighting District. Applications to County Sanitary Inspector, N. Macdonald, 124 Bridge St, Alexandria, by above date.

20 Aug.—Inverness C.C. Heating and electrical work in new County Buildings. Applications to County Clerk, R. Wallace, County Bldgs, Inverness, by above date.

20 Aug.—North Shields. Rewiring of two wards at Preston Hospital.—See 21 July issue.

22 Aug.—Armagh C.C. Supply of electrical equipment for school meals service. Supplies Officer, Education Office, Courthouse, Armagh.

22 Aug.—Castlederg R.D.C. Supply and erection of 79 fluorescent lanterns, etc.—See 28 July issue.

22 Aug.—Chelmsford. Subcontract 16. Provision and installation of cables, external lighting, heating and lighting of buildings, power distribution and control equipment for extension 2 at Brookend Sewage Disposal Works.—Advertised 21 July issue.

22 Aug.—Dunbarton C.C. Supply of Class "B" fluorescent lanterns to be mounted on 15 ft steel columns for Cumbernauld New Town Special Lighting District. County Sanitary Inspector and Lighting Superintendent, W. Arthur, 24 George Sq, Glasgow C.2.—Advertised in this issue.

22 Aug.—Ellesmere Port B.C. Provision and erection of 58 Group "A" columns, taking down 34 Group "B" columns and re-erection.—See 28 July issue.

22 Aug.—Enfield B.C. Section A: Supply of 316 140 W and 181 60 W integral jacketed sodium lamps, lanterns and gear. Section B: Supply of 316 25 ft and 181 15 ft concrete columns. Section C: Erection of columns/brackets/lanterns and removal of existing columns.—See 28 July issue.

22 Aug.—Frimley and Camberley U.D.C. Supply of 150 Group "A" steel columns. Advertised 4 Aug. issue.

22 Aug.—Hendon B.C. Supply of (Item 6) electrical fittings for period to 30 Sept., 1961. Borough Engineer and Surveyor, Town Hall, N.W.4.

22 Aug.—N.I. Hospitals Authority. Supply of (ii) electrical accessories for nurses' home. Secretary, Downpatrick Hospital Management Committee, Downshire Hospital, Downpatrick.

22 Aug.—Sunderland C.B. Electrical installation in Central Library and Museum extensions/alterations. Borough Architect, Grange Hse, Stockton Rd.

24 Aug.—Bridge-Blean R.D.C. Supply of duplicate 75 g.p.m. against a 105 ft head vertical spindle direct coupled centrifugal sewage pumps for Tyler Hill scheme.—See 14 July issue.

24 Aug.—Longbenton U.D.C. Supply and erection of Group 1 gas street lighting conversion, 133 sodium vapour units along main roads and 21 100 W filament lamps along other roads. Engineer and Surveyor, A. E. Sweetman, Council Offices, Forest Hall, Newcastle-on-Tyne 12. Deposit £3 3s.

25 Aug.—Cardiff C.C. Electrical installation on fixed price basis by contractor on N.I.C.E.I.C. Roll in "Bryn-y-Don," Approved School, Dinas Powis. City Surveyor, City Hall. Deposit £2 2s.

25 Aug.—Shannon Airport. Provision of electrical services in new freight terminal buildings. Dept. of Transport and Power, Kildare St, Dublin. Deposit £3.

27 Aug.—Cork C.C. Supply and erection of 300 g.p.m. centrifugal pumps and motors for Allow Regional Water Supply Scheme. Secretary, Cork C.C., Annabella, Mallow. Deposit £2 2s.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 104 queries answered this week

"Opermatic" industrial rotary ironers — makers of? E.M.E.B. — Improved Appliances and General Eng. Co. Ltd., Albion Wks, Park Way, Edgware, Middx.

"Mallard" floor scrubbers—makers of? A.M.W.D.—Cimex Fraser Tuson Ltd., Cray Ave, Orpington, Kent.

"Kego" lighting fittings—makers of? G.R.A.—Kego Electric Co. Ltd., Mount Pleasant, Wembley, Middx.

"Eziot" water heaters—makers of? B.O.G.—W. H. Smith (Eziot) Ltd., 32 Mansfield St, Church Gate, Leics.

"Tueten" fish fryers—suppliers of elements for? N.W.E.B.—H. A. Birch and Co. Ltd., Wilohm Wks, Wood St, Willenhall, Staffs.

"Lektrik" switches—address for? T.E.—Simplex Electric Co. Ltd., Broadwell, Oldbury, Birmingham.

"Halcyon" floor polishers—repairers of? E.E.B.—Electrix Ltd., Sterling Wks, Dagenham, Essex.

"Morco" lighting fittings—makers of? P.R.—T. B. Morley and Co. Ltd., Jameson St, Hull.

"Medrae" heated panels—makers of? L.E.B.—Dulrae Ltd., Spur Rd, North Feltham Trading Estate, Feltham, Middx.

27 Aug.—Staveley U.D.C. Supply and erection of 56 concrete columns, sodium lanterns, auxiliary gear and cable laying on A619, Worksop Rd.—Advertised 4 Aug. issue.

31 Aug.—Breconshire C.C. Electrical installation by contractors on N.I.C.E.I.C. Roll or E.C.A. members in new council chamber. County Architect, Rhyd Offices, Brecon.

31 Aug.—Leighton Buzzard U.D.C. Maintenance of street lighting system. Engineer and Surveyor, Council Offices.

31 Aug.—Newcastle-on-Tyne C.C. Supply and installation of two automatic lifts in each of seven 13-storey blocks of flats at Pottery Bank and Scotswood Rd. City Architect, 18 Cloth Market, Newcastle-on-Tyne 1.

31 Aug.—Renfrew T.C. Erection of alternative (a) 3 x 80 W fluorescent and (b) 400 W mercury schemes for A8 Inchinnan Rd street lighting improvements.—See 21 July issue.

31 Aug.—Wilton B.C. Installation of street lighting at Bulbridge Private Development Estate.—See 28 July issue.

1 Sept.—Dundee T.C. Supply and erection of multi-stage centrifugal pumps, accessories and switchgear for Menzieshill Pump Hse.—See 21 July issue.

1 Sept.—Farnborough U.D.C. Installation of 218 power points in 48 dwellings on Knellwood estate.—See 4 Aug issue.

1 Sept.—Kirkby-in-Ashfield U.D.C. Supply and installation of two 20 c.f.m. and one 35 c.f.m. sewage pumps and one 35 c.f.m. sludge pump complete with starters, switchgear, cables, etc.—See 28 July issue.

1 Sept.—Warrington R.D.C. Installation of 48 Class "B" street lighting units on A574, Warrington Rd, Risley.—See 21 July issue.

2 Sept.—Dublin C.B. Supply of 200 street lighting lanterns. Engineering and Town Planning Dept, 28-29 Castle St.

2 Sept.—Rothwell U.D.C. Provision and erection of 73 140 W sodium units with concrete columns along Leeds-Exeter Trunk Road, A.61. Engineer and Surveyor, Civic Bldgs, Rothwell, Leeds. Deposit £2 2s.

3 Sept.—Cambridge C.C. Supply of (Item d) lamps.—See 14 July issue.

3 Sept.—Irlam U.D.C. Supply and erection of three pumps, any two of which should deal with 350 cu ft per min at 36 ft head of unscreened sewage. Engineer and Surveyor, Council Offices. Deposit £1 1s.

5 Sept.—Manchester C.C. Supply and erection of lighting equipment/auxiliary services for primary sludge digestion plant.—Advertised 4 Aug. issue.

6 Sept.—Dartford B.C. Supply and erection of 91 Group "A" 400 W MBF/U lamps/lanterns on 25 ft reinforced concrete columns for town centre approach roads. Town Clerk, T. Armstrong, Council Offices, Deposit £2 2s.

6 Sept.—Lisburn U.D.C. Supply and erection of fluorescent street lighting equipments for improved lighting to Group "B" or Intermediate standards. Town Surveyor's Office, Town Hall.

7 Sept.—Cheadle and Gatley U.D.C. Supply and erection of 39 Group "A" pre-stressed spun concrete columns with 140 W sodium lamps/lanterns along Manchester Rd. Engineer and Surveyor, Town Hall, Abney, Cheadle, Ches. Deposit £2 2s.

8 Sept.—Guildford B.C. Supply, erection, cabling and bringing into service of 117 Class "A" lighting along A3100, A246 and A321. Borough Engineer and Surveyor, Municipal Offices.—Advertised in this issue.

10 Sept.—Waterford C.C. Supply of two 20 g.p.m. centrifugal pumps and motors for Kill and Bonmahon Water Supply Scheme.—See 28 July issue.

10 Sept.—Willenhall U.D.C. Erection of 92 Stanton 9A concrete columns and provision/fixing of 80 W mercury lanterns/lamps with necessary wiring.—See 4 Aug. issue.

13 Sept.—Londonderry R.D.C. Electrical installations in 18 dwellings, Altinure, and 16 dwellings, Claudy Brae. Details from W. and M. Given, 3 Richmond St, Londonderry. Deposit £3 3s.

No date stated—Herefordshire C.C. Installation of 210 lighting units for traffic signs on Ross Spur Motorway.—See 28 July issue.

No date stated—Lanark. Electrical work in (a) Wards 7 and 8 and (c) Nurses' Home, phase IV, at Stonehouse Hospital.—See 21 July issue.

No date stated—Southampton C.B. Electrical and mechanical work in (a) electrical machines laboratory and (b) steam engines laboratory at College of Technology.—Advertised 14 July issue.

No date stated—S. Warwickshire Hospital Group. Applications invited for inclusion in approved list of electrical contractors.—See 14 July issue.

No date stated—Whitby U.D.C. Supply and erection of 117 Group "A" steel octagonal columns, five wall brackets, seven Group "B" steel columns with 250 W colour-corrected mercury and 80 W mercury fluorescent lamps/lanterns/control gear.—See 4 Aug. issue.

TRADE NOTES

Agency. Aveley Electric Ltd., Aveley Industrial Estate, South Ockenden, have secured the agency in the UK for all products of the Allen B. Du Mont Laboratories Inc., USA.

Take-over. As from 1 Aug. the trading activities of Treforest Electrical Services Ltd. have been taken over and continued by South Wales Switchgear Ltd. (The acquisition we referred to on 28 July.)

CONTRACTS PLACED

Bedford B.C. Street lighting installations in various roads, Machinery Installations Ltd., £1,336. Recommended.

Birmingham Hospital Board. Provision of: electrical services in improved outpatients accommodation at Warwick Hospital, Thompson Electrical Co. Ltd., £2,427; rewiring, phase II at Shelton Hospital, T. Wood and Sons (Chester) Ltd., £2,200; electrical services in ward alterations, Groundslow Hospital, H. Palfreyman Ltd., £3,110; electrical services maternity accommodation at Victoria Hospital, Hereford, Parker Winder and Achurch Ltd., £2,713; electrical services ward modernisation at Birmingham Accident Hospital, H. Pratt Ltd., £1,635. Recommended.

Churchdown P.C. Supply and installation of 94 street lighting columns, Cohen Bros. (Electrical) Ltd., £4,963; supply of electrical equipment, General Electric Co., £1,983; provision of cables, Midlands Electricity Board, £1,600.

Hebburn U.D.C. Electrical work in alterations at St. Andrew's Institute, Norman Robinson, £435.

Houghton-le-Spring U.D.C. Supply of: columns, Concrete Utilities Ltd. and Stewart and Llovds Ltd.; street lighting lanterns, Revo Electric Co. and General Electric Co.

London C.C. Electrical installations in Blocks 1-4 Ashmore Pl, Lambeth, Electrical Contracting Co., £3,115.

Middlesbrough T.C. Rewiring Dacre St baths, Haigh and Ringrose Ltd., £276 14s.

Northumberland C.C. Electrical work in new Newbiggin Hall County Secondary and County Primary Schools, F. Reid Terense Co. Ltd.

Nottingham T.C. Provision of lift extension and electrical services for additional floor on North Church St block, Evans Lifts, £911, and East Midlands E.B., £1,821 respectively. Recommended.

Paddington B.C. Concrete columns and equipment for gas street lighting conversion scheme, Engineering and Lighting Equipment Co., £7,810. Recommended.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

23 Aug.—New Zealand. Thirty 650 V pillar type switchboards, spare feeder units and cable boxes. Town Clerk, Town Hall, Wellington. B.o.T. (ESB/19636/60).*

23 Aug.—New Zealand. Six 600 and six 750 kVA 3-ph. 10,750/415/240 V transformers. Town Clerk, P.O. Box 2199, Wellington C.1. B.o.T. (ESB/19886/60).*

24 Aug.—Burma. Seventy-two items of carbon resistors. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/19873/60).*

24 Aug.—South Africa. One ten-ton o/h travelling crane. Chairman, Natal Provincial Tender Board, P.O. Box 358, Pietermaritzburg. B.o.T. (ESB/19683/60).*

26 Aug.—South Africa. Ten miles telephone cable, four items, and two items of 7,453 ft telephone cable. Town Clerk, City Hall, West St, Durban. B.o.T. (ESB/19647/60).*

27 Aug.—India. Transformers/switchgear for Solan. Executive Engineer, H.E. Division, No. III, Hamachal Pradesh P.W.D., Solan. B.o.T. (ESB/19864/60).*

28 Aug.—America. One duplex 115 kV control board section for Rugby substation, N. Dakota. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 25, Colorado. B.o.T. (ESB/19900/60).*

31 Aug.—New Zealand. 5,400 lb 11 s.w.g. and 1,500 lb 16 s.w.g. copper wire. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/19619/60).*

1 Sept.—Egypt. H.T. and l.t. cables for new dry dock and arsenal area. Ports and Lighthouses Administrations, Arsenal Gate, No. 1, Alexandria. B.o.T. (ESB/19530/60).*

2 Sept.—New Zealand. Six disconnecting switches and two air-break switches. Town Clerk, P.O. Box 803, Dunedin. B.o.T. (ESB/19618/60).*

8 Sept.—New Zealand. Street lighting. City Electrical Engineer, P.O. Box 167, Napier. B.o.T. (ESB/19575/60).*

12 Sept.—New Zealand. Two 2,000 A 50 V d.c. circuit-breakers; 150 250 V relays; 400 B.P.O. 3,000 type relays, spring set assemblies and mercury tubes. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/19628/60).*

13 Sept.—New Zealand. Twenty 11 kV, 3-ph. 250 MVA ring main units. Town Clerk, P.O. Box 2199, Wellington. B.o.T. (ESB/19635/60).*

28 Sept.—Ceylon. Two 2 MW 11 kV generating sets for Central Power Station, Chunnakam. Tender Board, Ministry of Posts, Works and Power, Transworks Hse, Colombo 1. B.o.T. (ESB/18486/60).*

30 Sept.—South Africa. One ten-ton portal jib wharf crane for S.A. Railways. Chairman, Tender Board, P.O. Box 7784, Johannesburg. B.o.T. (ESB/18820/60).*

4 Oct.—Canada. Eight of 14.4 kV and two of 4,160 V metalclad switchgear units for Squaw Rapids Plant. Saskatchewan Power Corpn., Saskatoon. B.o.T. (ESB/19866/60).*

15 Oct.—Sudan. Twenty-four items of laboratory equipment including five-section switchboard, service units, motor generators, cable, connectors, switches and fuse links. Principal, Khartoum Technical Institute, Khartoum. B.o.T. (ESB/18899/60/ICA).*

15 Nov.—New Zealand. Ten s.-ph. 11,111 kVA, 11/127 kV transformers. Secretary, Tenders Committee, N.Z. Electricity Dept., Wellington. B.o.T. (ESB/19637/60).*

29 Nov.—New Zealand. 38,888 kVA, 11 kV, 3ph vertical shaft generators. Secretary, Tenders Committee, N.Z. Electricity Dept, Wellington. B.o.T. (ESB/17156/60).*

29 Nov.—New Zealand. Two 50,000 h.p. vertical shaft Francis type water turbines or turbines/generators. Secretary, Tenders Committee, N.Z. Electricity Dept, Wellington. B.o.T. (ESB/17155/60).*

BUSINESS PROSPECTS

Antrim C.C. Tender: Knockahollet New primary school and meals kitchen, near Ballymoney, also teachers' residence. Education Architect.

Barrow-in-Furness. Vickers-Armstrong plan health physics building.

Barry. Mobil Oil Co., Caxton Hse, S.W.1, plan sealed bulk terminal on nine-acre site. Own architects.

Belfast. Tenders to be invited in August for Ulster War Memorial building, architects: Michael Bewley and W. Granville Smyth, 22 Lombard St.

Berwick. Barrett, Sons and Ptnrs, High Bridge, Newcastle, quantity surveyors for Regional Hospital Board's Berwick Infirmary ward block. J. F. Simpson and Co., Greenbatt, Alnwick, plan Tweedside estate premises.—T.C. plans two swimming baths. Surveyor.

Bishop Auckland U.D.C. Tender: 85 houses, nine bungalows, Woodhouse Close Estate. Surveyor.

Brighton. Five-storey £300,000 office/shop block planned, Queen's Rd, by Thames Estates and Investments Group, 14 Waterloo Pl, S.W.1.—Eagle Star Insurance Co., 1 Threadneedle St, E.C.2, plan five-storey offices, Churchill Hse.

Buckhaven (Fife). S.E. Regional Hospital Board, 11 Drumsheugh Gdns, Edinburgh 3, plan 60-bed extension, Randolph-Wemyss Memorial Hospital.

Bury B.C. Tender: 76 Killon and Price St dwellings. Engineer.

Caernarvonshire. Merseyside Engineering (Refrigeration) plan factory.

Cambridge. Chamberlin, Powell and Bon, 15 Avenue Studios, Sydney Mews, S.W.3, architects for £1¼ million New Hall College dining hall block.

Cardiff. British Transport Commission plans motor repair shop, Sanaquahar St.—British Oxygen Co., Maescoed Rd, Whitchurch, plan extensions, architects: R. Towning Hill and Ptnrs, 29 Gt. George St, Bristol.—Roath abattoir extensions and improvements to cost £210,000.

Carlisle. P. H. Knighton and N. Edgar, 72 Warwick Rd, architects for £12,500 extension of Cumberland Infirmary wards. T.C. plans traffic lights, junction of Scotland Rd and Etterby St.—T.C. plans £86,000 reconstruction work at Willowholme sewage works. Engineer.—Extension to College of Art planned for T.C.—F. G. Jackson, Lowther Arcade Chmbrs, Lowther St, architect for showroom, workshops and storage at London Rd for Scottish Motor Traction Co.—J. B. Dand, 77 Warwick Rd, architect for workshop/warehouse in Byron St for F. Proudfoot.—E.C. plans £93,000 Harraby School additions.

Consett U.D.C. J. G. Poulson, 54 Albert Rd, Middlesbrough, architect for £100,000 swimming baths scheme.

Coventry. Precious Metal Depositors, 4 Hearsall La, plan light industrial site premises.—Extensions planned to following factories: Edgar Clews Ltd., Torrington Ave; Veasey and Sharples, Broad La; The Torrington Co., Torrington Ave; Gosford Tool and Equipment Co., Torrington Ave; H. A. Smith, Burnsall Rd; and storage depot/offices, Torrington Ave, for Covenant Securities.—British Road Services, 222 Marylebone Rd, N.W.1, plan Charter Ave offices/parcels depot/workshops and warehouse, etc.

Chorley (Lancs). M. of Health approve Chorley and District Hospital nurses' home scheme by Manchester Regional Board.

Denton U.D.C. Tender: 32 bungalows, Dark La Farm No. 3 site. Engineer.

Down C.C. Tender: Health Committee's Kilkeel Child Health Clinic at Knocknee Ave. Planning Officer.

Durham. Wm. Leech (Builders) Ltd., St. James St, Newcastle, plan 71 pairs semi-detached houses and eight detached houses, Framwellgate Moor.—C.C. plans £544,000 total building schemes. Architect.

Easington. J. Nimmon and Sons, Castle Eden, Co. Durham, plan mineral water factory and offices extensions.

East Barnet U.D.C. Tender: block 18 dwellings, Bulwer Rd. Engineer and Surveyor.

Edinburgh T.C. Tender: 42 Redbraes houses. City Architect.

Eccles. J. Chapman and Son (Patricroft), 19 Green Lanes, plan workshop.—W. L. Crossley and Co., architects for L. Gardner and Sons pattern shop extensions, Barton Hall Engine Works.

Essex. C. Health Committee approve £27,650 Colchester hostel and £49,439 mental health service occupation centre, Romford.—County clinic, Hutton, at £9,500 planned. Architect.

Eston. Shannon (Contractors), 44 Marsh Rd, Middlesbrough, plan Lodge Farm scheme for 500 houses, shopping centre, hotel, etc.

Gateshead. Corporation Art Gallery Committee approves £30,000 Shipley Art Gallery extension scheme. Borough Engineer.—14 Newbury Ave houses planned. Engineer.—W. H. Oliver, 25 Simpson St, Newcastle, plan 12 Maple Grove flats.

Glasgow. T. M. Miller, 19 Lynedock Cres, C.3, architect for Murrayfield Real Estate Co.'s £200,000 shopping centre on Elephant Cinema site.

Gosport. W. H. Saunders and Son, 133 High St, architects for ten Cowplain Properties factory units, Dolman Rd.

Halifax B.C. Tender: all trades for conversion of "West Garth," Victoria Rd, to children's home. Engineer.

Hampshire. Hovercraft Development, 1 Tilney St, W.1, plan use of land at the Grove and the R.N. Camp, St. John's St, Hythe, for engineering facilities, drawing offices and canteen.

Hebburn-on-Tyne. Pyrotenax Ltd., Hedgeley Rd, plan factory extension.

Hemel Hempstead. Sir William Baird and Ptnrs, 7 Catherine Pl, S.W.1, quantity surveyors for £50,000 Roto Finish extensions.

Henley-on-Thames. £25,000 Townlands Hospital extensions planned.

High Wycombe. Thurlow, Lucas and Janes, 86 Eastern St, architects for J. W. and T. Connolly, Dashwood Ave.—Ian Fraser and Assoc., 17 Bedford St, Strand, architects for Cressex Properties Ltd. factory/offices.

Inverness. Northern Regional Hospital Board plan Raigmore general hospital.

Isle of Wight. Columbia Products, 1 Dukes Ave, W.4, plan £75,000 factory.

Leeds. Executex Clothes, 98 Kirkstall Rd, plan factory, offices and canteen.

Leicester. T. Worthington and Sons, 178 Oxford Rd, Manchester, architects for Theatre Royal office block for Leicester Permanent Building Society. Wadkin, Green La Works, plan factory extensions.—Allcock and Grieves, 11 Leicester Rd, Loughborough, architects for Uneedus Hosiery Co., 69 East Bond St, Leicester, premises at Vaughan Way.—Oakland Presstool Co., 191 Willow St, plan industrial development, Humberstone La.

Liverpool. Tysons (Contractors), Dryden St, contractors for £1,112,469 College of Technology.

London. Denhams (Norwich) Ltd., St. George's Wks, All Saints Rd, W.3, plan industrial development on 1,950 sq yd S. Acton Redevelopment Area land.—A. E. Mallandiain Ltd. plan extensions to Victoria Paper Mills factory, Victoria Rd.—J. Smithehurst and Co., 55 Rothschild Rd, plan factory extensions.—B. C. Calder, 1 Salisbury Sq, E.C.4, plan 42 Bacon St, Bethnal Green, warehouse.—Young and Hall, 9 Southampton Row, W.C.1, architects for 11 Ogle St, W.1, school.—C.C. approve scheme for 1,650-place school, Lollard St, Lambeth.—Co-Partnership, 44 Charlotte St, W.1, architects for £674,105 adaptation of Borough-Beaufoy School to engineering workshops.—Major Elie Mayorcas, 13 David Mews, Baker St, W.1, architect for £68,800 extending of Vauxhall Manor School, Lambeth.—James Cubitt and Ptnrs, 25 Gloucester Pl, W.1, architects for £47,440 school for physically handicapped, St. Margaret's Cres, Wandsworth.—New secondary school for boys planned, White Horse La, Stepney.—£194,734 school for 450 boys planned at Kentworthy Rd, Hackney, to house Cardinal Pole R.C. School.—Armstrong and McManus, 28 Gloucester Pl, W.1, architects for Daneford School, Bethnal Green, adaptations, £371,520 cost.—Co-Partnership, 44 Charlotte St, W.1, architects for Wolfson Laboratory at Imperial Institute Rd, S.W.1, for Imperial College of Science and Technology.—Trollope and Colls, 1 Noble St, E.C.2, contractors for £150,000 High Rd, E.18, office block for Northern Assurance Co. Ltd.—Wm. Willitt Ltd., Sloane Sq, S.W.1, contractors for £180,000 City Rd, E.C.1, office block for Edison Square Developments Ltd.—Chamberlin, Powell and Bon, 15 Avenue Studios, Sydney Mews, S.W.3, architects for The Barbican redevelopment scheme.—C. H. Elsom and Ptnrs, 10 Lower Grosvenor Pl, S.W.1, architects for 1-5 York Gate premises, N.W.—Michael Rosenauer, 28 Lincoln's Inn Fields, W.C.2, architect for 28-storey hotel, Portman Sq, W.1.—Lewis Solomon, Son and Joseph, Thavies Inn Hse, Holborn Circus, E.C.1, architects for rebuilding of Stanhope Gate office block, W.1.—Chapman, Taylor and Ptnrs, Grand Bldgs, Trafalgar Sq, S.W.1, architects for Chesterfield Gdns, W.1, offices, for Collins and Collins and Rawlence and Squarey.

Lowestoft. Yarecraft Marine Ltd. plan factory, offices, etc., southern end of Pier Terr and The Town Quay.—Boulton and Paul, Riverside Wks, Norwich, to buy site.

Luton. Hyward Tyler and Co., Crawley Green Rd, plan Kimpton Rd area factory.—Weldaform, 81 Wenlock St, plan engineering works, Brunswick St.—Metal Fabrications Ltd., 193a Marsh Rd, plan workshop and offices, Connaught Rd area.—Home Counties Newspapers, Manchester St, plan works and offices, Holly St and Castle St.—P. M. Laycock, 18 Guildford St, to buy seven to 15 Taylor St sites.

Lymington. Ten-acre New Milton site marked by B.C. for industrial development.

Lytham. W. C. Evans and Co., Chadwick Rd, Eccles, plan modern factory on site of RAF railhead, Lytham.

Manchester. Manchester College of Science and Technology 14-storey student's residential block, Sackville St area, planned.—Byrom Properties, Stocks St, Cheetham, plan factory-warehouse. Regional Hospital Board, Cheetwood Rd, plan Prestwich Hospital annexe kitchen; nurses' accommodation building, Burton Rd; and conversion of pathological laboratory, Royal Infirmary, Preston, into out-patients' department—T.C. Tender: 370 Blackley New Rd dwellings. Director of Housing.

Middlesbrough. Corporation Welfare Committee plan 42-place old persons' home.

Mitcham B.C. Tender: Stage 1 Phipps Bridge scheme, 21 houses and 136 flats. Engineer.

Northallerton U.D.C. R. B. A. Moody Bros., Northallerton contractors for 22 houses, eight flats, Forest Rd estate.

Northumberland C.C. Tender: Whitley Bay Further Education Centre assembly hall and lecture room. Architect.

Norwich. R. C. Carter, Drayton, contractors for £400,000 Kingswick Hall Training College.

Petersfield. Sir John Brown, A. E. Henson and Ptnrs, 117 Sloane St, S.W.1, architects for Raglan Developments' office block on Swan St site.

Plymouth. T.C. plans £300,000 factory erection scheme on various sites.

Reading. Reading, Green and Marvell, Kennet Side, plan office block, Kennet Side.

Redditch. W. G. Smart and Co., Ham Market, Wrentham St, Birmingham 6, plan Arthur St bacon and food factory.

Scarborough. North Riding Training College additions, etc., planned. County Education architect, Northallerton.

Business Prospects continued

Shildon. U.D.C. plans 12-acre factory development, Dale Rd.

Shrewsbury. D. du R. Aberdeen, 19 Southampton Pl, W.C.1, architect for multi-storey blocks developments for shops/offices, etc., for City and Town Buildings Ltd.

Smethwick. Warriner and Mason, 9 Taunton Rd, Birmingham 12, plan Beacon Works, Reginald Rd, structure.

Stafford. Common Rd 53-acre site to be acquired by B.C. for industrial development.

Stromness. Orkney Fishermen's Society, 59 Alfred St, plan £11,000 processing factory.

Swindon. Corporation tenders soon to be received for industrial estate factory.

Tideswell. Swift, Levick and Sons plan works extensions.

Torquay. Mineral water and bottling factory planned by Tolchard and Son, Torre, Torquay and Newbar Rd.—Jantzen, Rayleigh Wks, Barnstaple, plan four-acre industrial development.

Wednesbury. W. G. Allen, 32 Hylton St, Birmingham 18, plan Holyhead Rd factory extensions.—Frost and Sons (Moxley) Ltd., Falcon Wks, Moxley, plan office block at Church St.—Ega Electric plan Holyhead Rd factory extensions.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Ball Brothers Electrical (Cannock) Ltd. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Jean Herbert and Thos. A. Herbert, 156 Strand, W.C.2.

T. J. Butler and Sons Ltd., 67 Chester Rd West, Shotton, nr. Chester. Manufacturers, wholesalers and retailers of electronic equipment, etc. Nom. cap.: £2,500. Dirs.: Thomas J. Butler and Mary Butler.

Cavitation Research Ltd. Research engineers for the manufacture of, or dealers in, the electronic means of controlling and holding permanent suspension oil additives of all kinds, etc. Nom. cap.: £100. Dirs.: John R. Chaplin, 63 Berkeley Hse, Hay Hill, W.1; James E. Coltman, PH.D., 53 Hamilton Ave, Ilford, Essex; and Leslie F. Day, 17 St. Georges Dr, S.W.1.

MacCarthy Services Ltd., 15 Sandhill, Newcastle-on-Tyne. Heating, ventilating and electrical engineers, etc. Nom. cap.: £1,000. Dir.: Charles P. MacCarthy.

Midland Auto Components Ltd. To carry on business of factors, distributors, manufacturers and dealers in electrical and wireless apparatus; motor-car and component part manufacturers and dealers, etc. Nom. cap.: £100. Dirs.; not named. Subs.: George C. Roberts, 5-21 De Vere Gdns, W.8; and Robert Cassey, 53 Shakespeare Dr, Shirley, Solihull.

Park Hall Agency and Distributors Co. Ltd., Park Hall, Brynamman, nr. Swansea. Electrical and domestic and household appliances, etc. Nom. cap.: £100. Permanent dirs.: David R. Jones and Mrs M. Jones.

Rediffusion Industrial Services Ltd., Carlton Hse, Lower Regent St, S.W.1. Designers and manufacturers of and dealers in communications systems and apparatus, etc. Nom. cap.: £10,000. Dirs.: to be appointed by subs. Subs.: Frederick J. Bellchambers and Charles J. Tingham.

Rega Brucker and Co., Park Chmbrs, Park Pl, Cardiff. Manufacturers of and dealers in electrical, electronic, radio and television equipment, etc. Nom. cap.: £1,000. Dirs.: To be appointed by Rega Brucker and Co., of Siegburg, nr. Cologne, Germany. Subs.: Colin M. Possart and William L. Ducie.

Rice and Saunders (Winnersh) Ltd., Moss Cottage, Robin Hood La, Winnersh, Berks. Electrical contractors and equipment suppliers and engineers, etc. Nom. cap.: £1,000. Permanent dirs.: Leslie W. Rice and Geoffrey A. Saunders.

D. Roe (Electronics) Ltd., 5 Alice St, Keighley. Nom. cap.: £5,000. Dirs.: Derek Roe, John E. Merrall and Alec W. Merrett.

Rollite Products (Bridlington) Ltd., 3 The Crescent, Bridlington, Yorks. Manufacturers of and dealers in artificial lighting apparatus, electrical plant and machinery, etc. Nom. cap.: £4,000. Dirs.: Eric A. Rollinson and Moira A. Rollinson.

Scopetronics Ltd. Manufacturers and designers of and dealers in electronic, electrical, mechanical and other instruments, etc. Nom. cap.: £100. Dirs.: to be appointed by the subs. Subs.: Azamat Guirey, 60 Chester Sq, S.W.1, D. H. Worth, 5 Dean Court, Kingston Rd, Tolworth, Surrey, and R. McEwen, 9 Tregunter Rd, S.W.10.

Senior Domestic Appliances Ltd. Nom. cap.: £10,000. Dirs.: Wm. H. C. Payne and John A. Brown. Subs.: R. B. Nowell and H. A. Stewart, 50 Cornhill, E.C.3.

Universal Agencies (Hull) Ltd., 34 New Rd, Hedon, Hull. To manufacture and deal in electrical appliances, household furnishings, etc. Nom. cap.: £1,000. Dirs.: Maurice H. Clark and Leslie F. V. Fawcett.

Wire Vision Ltd. To relay, diffuse, reproduce or broadcast by wire, closed circuit or otherwise television and radio programmes, etc. Nom. cap.: £50,000. Dirs.: Laurence S. Hargreaves and Alfred E. Francis, O.B.E. Subs.: Peter O. Trotman and Jeffery J. Maunsell, 30 Bouverie St, E.C.4.

Gazette Announcements

COMPANIES ACTS

Springhill (Electrical Maintenance) Ltd. Winding-up order dated 25 July.

Williams (Kidderminster) Ltd. Creditors to send details to liquidator: R. F. Bendall, 126 Colmore Row, Birmingham 3, by 16 Sept.

Whitetrade Ltd. Meetings of creditors and contributories to be held at Court Hse, Eastgate, Rochester, on 18 Aug., at 11 and 11.30 a.m., respectively.

Treforest Electrical Services Ltd. Mr S. R. Leyshon appointed liquidator at extraordinary general meeting on 30 July for the purpose of winding-up and to distribute the assets to South Wales Switchgear Ltd.

Hobday Bros. Ltd. Creditors to send details to liquidator, O. G. Sunderland, 15 Eastcheap, E.C.3, by 9 Sept.

BANKRUPTCY ACTS

Receiving Orders

High Court of Justice. P. Connelly, electrician, of 6 Rayne Ct, N.18. Receiving order dated 29 July.

Sheffield. S. D. Archer, domestic appliance retailer, carrying on business as Telefixe at 100 Attercliffe Common. Receiving order dated 25 July.

Appointment of Trustees

Middlesbrough. D. W. F. Delve, radio, television and electrical dealer, carrying on business at 182 High St, Eston, and 107 Parliament Rd, Middlesbrough. Mr C. G. Sparrow, Barrington Hse, 2 Bowesfield La, Stockton-on-Tees, appointed trustee as from 22 July.

Bradford. E. Smith, electrical contractor, carrying on business at 28 Heaton Rd, Bradford 8. Mr R. W. Hellyer, Brotherton Chmbrs, Westgate, Leeds 1, appointed trustee as from 25 July.

Intended Dividend

Hastings. W. J. Broomfield, formerly carrying on business as Bone Electric Fencing System, Churchfield Cottage, Gt. Glemham, Saxmundham. Last day for receiving proofs for intended dividend: 13 Aug., to trustee: T. H. Parker, 8 Old Steine, Brighton 1.

Dividend

Burton-on-Trent. A. H. Fallon, M. Horton and A. E. Wheildon, radio and television engineers, lately carrying on business as Fallon Electrics at 135 Waterloo St and rear of 148 Waterloo St, M. Horton and A. E. Wheildon also carried on business as Monarch Electrics, electrical and mechanical engineers, at 6 Victoria Rd, Burton-on-Trent. Dividend per £: 3¼d, payable at office of trustee: A. N. Hunter, Walter Hse, 418-422 Strand, W.C.2, on 18 Aug.

Public Examinations

Burnley. E. H. Thornton, electrical engineer, formerly carrying on business as Thorntons Electrical Services at 17 Hebrew Rd, Burnley. Public examination: 11 a.m., 8 Nov., at Court Hse, Bankhouse St, Burnley.

Pontypridd and Ystradyfodwg. G. G. Burton and W. J. Newhams, wholesalers and retailers of domestic appliances, formerly carrying on business as Nuelectrics (Burton and Newhams) Co., at 222 Bute St, Cardiff. Public examination: 10.30 a.m., 13 Oct., at Court Hse, Courthouse St, Pontypridd, Glam.

Stockport. T. W. Smith, domestic appliance manufacturer and dealer, formerly carrying on business as Stockport Domestic Appliances, and in partnership as Delta Engineering at 94 Lancashire Hill, Stockport. Public examination: 10.30 a.m. 28 Oct. at Court Hse, Vernon St, Stockport.

Application for Discharge

Croydon. H. R. Jowett, electrical appliance retailer, formerly carrying on business as J. and L. Domestic Supplies Co., at 60 Church Rd, S.E.19. Order made on 30 June: discharged as from 30 Dec., 1960.

Release of Trustees

Birmingham. K. F. Haylor, manufacturer and designer of lighting fittings, carrying on business as Lighting Developments at 67 Lyncroft Rd, Hall Green, and formerly at 70 Summer La, Birmingham. Trustee: W. H. Haigh, Somerset Hse, 37 Temple St, Birmingham 2, released as from 20 July.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Aerialite. 788,583. Class 7. Machines for washing, drying, etc. Aerialite Ltd., Castle Wks, Stalybridge.

Berfrost. 794,394. Class 11. Refrigerating and defrosting apparatus, etc. Heron Heating Devices Ltd., Ardea Wks, Church St, Newcastle-on-Tyne 6.

Centurion. 803,602. Class 11. Refrigeration apparatus, etc. Bylock Electric Ltd., 109 South St, Enfield, Middx.

Creco. 804,633. Class 9. Sound recording and reproducing apparatus, etc. Colben Electronic Eng. Co. Ltd., 57 London Rd, Crayford, Kent.

Janitor. 801,300. Class 7. Floor cleaning, polishing, scrubbing, squeegee, carpet cleaning machines, etc. R. G. Dixon Ltd., Capitol Wks, Empire Way, Wembley, Middx.

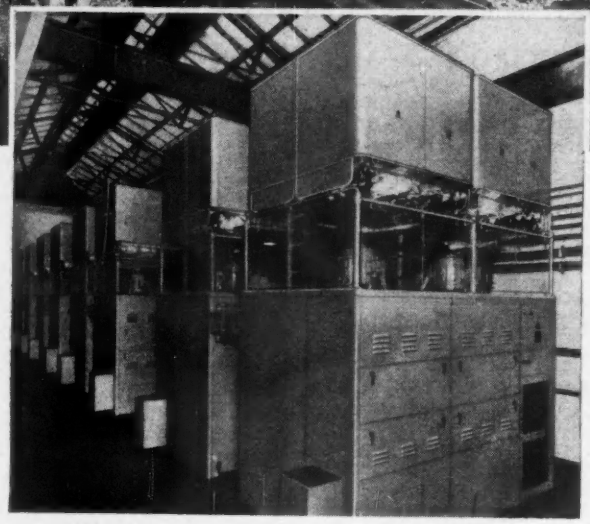
Magnetor. B797,284. Class 9. Electromagnetic clamps, etc. Wilhelmsburger Maschinenfabrik Hinrichs und Sohn, Geesthacht, near Hamburg.

Ruton—in design. 797,841 and 2. Class 7. Domestic machines, etc. Electrische Apparaten-en Metaalwaren-fabrieken Rudolf Blik N.V., Televisiestraat hock Rutonweg, The Hague, Netherlands.

Silicontrol. 796,564. Class 9. Control apparatus and instruments. W. A. Brown, 71 Garley Rd, Stamford, Connecticut, USA.

Uni-Joint. B798,290. Class 17. Porcelain or steatite insulating beads. V. G. Porcelain Co. Ltd., 3-11 Gorst Rd, Park Royal, N.W.10.

Zetfax. 795,603. Class 9. Teleprinting and telegraphic apparatus, etc. Dr Ing R. Hell, Grenzstrasse 1 - 5 Kiel - Dietrichsdorf, Germany.



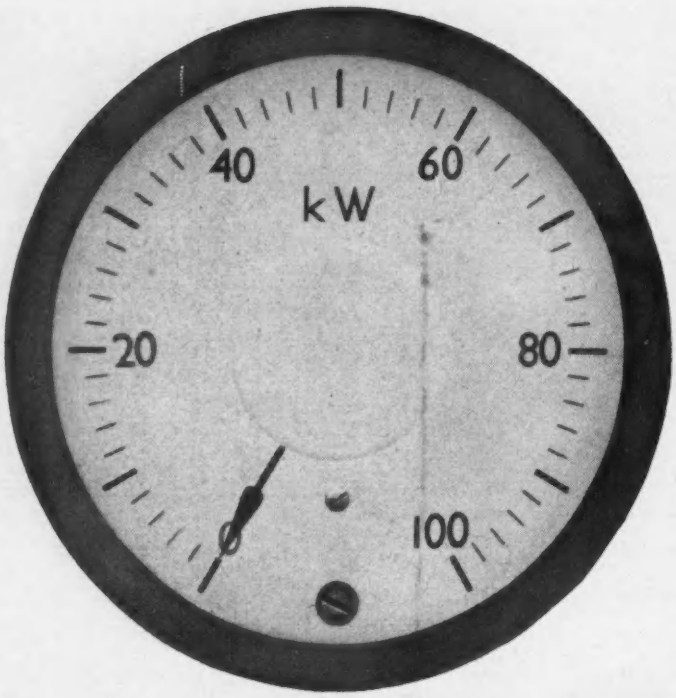
The illustrations show a train on the Northern Line at Hendon and the 4,000 kW substation at Bond Street (Central Line) equipped exclusively with Hewittic Rectifiers. The plant comprises four 1,000 kW combined rectifier and transformer units, the transformers being totally enclosed air-cooled. This Company is also responsible for the supply and installation of all A.C. and D.C. control gear at this substation. Some 90,000 kW of Hewittic Rectifiers have been supplied to the London Transport Executive.

Over 1½ million kW
In World Wide Service

*** HEWITTIC RECTIFIERS—PUMPLESS—AIR COOLED—UP TO ANY CAPACITY**

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"

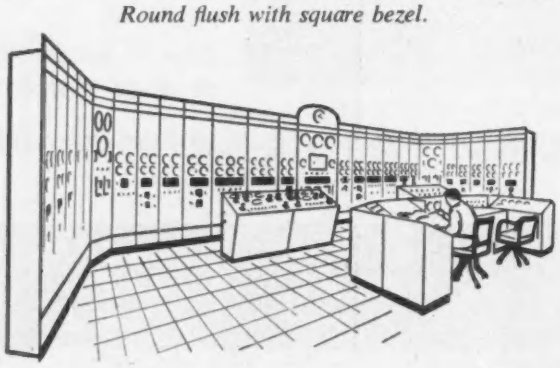
OVERSEAS REPRESENTATIVES: ARGENTINA: H. R. Roberts & Cia., S.R.L. Buenos Aires. **AUSTRALIA:** Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W.: Queensland: W. Australia: Elder, Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. **BARBADOS** and surrounding islands: Electric Sales & Service Ltd., St. Michael. **BELGIUM & LUXEMBOURG:** Pierre Follie, Brussels, 3. **BRAZIL:** Oscar G. Mors, Sao Paulo. **BRITISH GUIANA:** Dandor Commission Agency, Georgetown. **BURMA:** Neonlite Manufacturing & Trading Co. Ltd., Rangoon. **CANADA:** Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal; The Northern Electric Co. Ltd., Montreal, etc. **CEYLON:** Envee Ess Ltd., Colombo. **CHILE:** Sociedad Importadora del Pacifico Ltda., Santiago. **EAST AFRICA:** G. A. Neumann Ltd., Nairobi. **EGYPT:** Giacomo Cohenca Fils, S.A.E., Cairo. **FINLAND:** Sahko-ja Konelilke O.Y. Hermes, Helsinki. **GHANA, NIGERIA & SIERRA LEONE:** Glyndova Ltd. **GREECE:** Charilaos C. Coronecos, Athens. **INDIA:** Steam & Mining Equipment (India) Private Ltd., Calcutta; Easun Engineering Co. Ltd., Madras. I. **IRAQ:** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO:** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NETHERLANDS:** J. Kater, E.O., Ouderkerk a.d. Amstel. **NEW ZEALAND:** Richardson, McCabe & Co Ltd., Wellington, etc. **PAKISTAN:** The Karachi Radio Co., Karachi, 3. **SOUTH AFRICA:** Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. **CENTRAL AFRICAN FEDERATION:** Arthur Trevor Williams (Pty.) Ltd., Salisbury. **THAILAND:** Vichien Phanich Co. Ltd., Bankok. **TRINIDAD & TOBAGO:** Thomas Peake & Co., Port of Spain. **TURKEY:** Dr. H. Salim Oker, Ankara. **URUGUAY:** Ciuna Ltda., Montevideo. **U.S.A.:** Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburgh 30, Pennsylvania. **VENEZUELA:** Oficina de Ingenieria Sociedad Anonima, Caracas.



Long-range readability
WITH
AEI instruments

With its modern scale presentation, the AEI FC2 Wattmeter can be accurately read from a distance of many feet. It is typical of a wide range of instruments from AEI, including voltmeters, ammeters, power factor indicators and synchroscopes, developed for ease and reliability of use in modern power stations.

DIAL SIZES: *4 in., 6 in., and 8 in.*
PATTERNS: *Round projecting. Round flush (as illustrated). Round flush with square bezel.*



AEI

Enquiries to the address below or to your local AEI Office.

Instrumentation Division — Instrument and Meter Department
Associated Electrical Industries Limited
Trafford Park, Manchester, 17

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

COUNTY COUNCIL OF DUNBARTON
Cumbernauld New Town Special Lighting District

QUOTATIONS are invited from Electrical Suppliers for the supply of Class "B" Fluorescent Street Lighting Lanterns, suitable for mounting on 15 ft steel columns.

Suppliers who desire to offer are requested to forward specification details and drawings of the Lanterns they can supply, together with time of delivery, to the County Sanitary Inspector and Lighting Superintendent, Mr. William Arthur, 24 George Sq, Glasgow C.2, not later than Monday, 22 Aug., 1960.

JOHN F. MILLER,
County Clerk.

County Buildings,
Dumbarton.
1 Aug., 1960. (R 608)

BOROUGH OF GUILDFORD
Class "A" Street Lighting

TENDERS are invited for the Supply, Erection, Cabling, Jointing and bringing into service of 117 No. Class "A" Lighting Units on London Rd, A.3100; Boxgrove Rd, A.246; and Worplesdon Rd, A.321.

General Conditions of Contract and Drawings can be inspected at, and Bills of Quantities and Specification obtained from the Borough Engineer and Surveyor, Municipal Offices, Guildford.

Tenders, in the envelope provided, must be delivered to me not later than 12 noon on Thursday, 8 Sept., 1960.

HERBERT C. WELLER,
Town Clerk.
(R 657)

APPOINTMENTS VACANT

CITY OF MANCHESTER AIRPORT DEPARTMENT
TWO ASSISTANT STATION ENGINEERS

APPLICATIONS are invited from suitably qualified persons with mechanical and electrical experience. Knowledge of airfield installations desirable. Post graded Miscellaneous Grade X, £945/£1,010 per annum.

Particulars and application forms (stamped addressed foolscap envelope) from Airport Director, Manchester Airport, Wythenshawe, Manchester 22, returnable by 27 Aug., 1960.
(R 629)

CORPORATION OF GLASGOW
Architectural and Planning Department
ASSISTANT ENGINEER (ELECTRICAL)

APPLICATIONS for the above superannuable appointment are invited from Graduates and Associate Members of The Institution of Electrical Engineers. Salary scale £795/£1,385 with placing according to qualifications and experience. There is a point within the scale at which increments may be accelerated.

Form of application may be obtained from the Principal Administrative Officer, 20 Trongate, Glasgow C.1.

A. G. JURY,
City Architect and
Planning Officer.
(R 630)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Division
CROYDON "B" GENERATING STATION
Vacancy No. 171/60.
SHIFT CONTROL ENGINEER

CANDIDATES should have had experience of Power Station operation generally and of electrical control room work in particular and should preferably have undertaken technical training to H.N.C. level.

Salary: N.J.B. Class J Grade 10, £1,194/£1,331 10s per annum including Shift and London Allowances.

Applications on standard form AE6/ACT where possible and giving age, details of experience, etc., should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, to arrive by 24 Aug., 1960.

W. H. DUNKLEY,
Divisional Controller.
(R 644)

MINISTRY OF WORKS
Requires
ELECTRICAL DRAUGHTSMEN FOR DUTY IN LONDON

APPLICANTS should be capable of designing Lighting and Power Distribution for various types of building. A knowledge of control wiring, H.T. and substation design is also desirable.

QUALIFICATIONS:
O.N.C. or equivalent standard.

SALARY:
(Now under review.) £570/£900 per annum, London (slightly less elsewhere) according to age and experience. Prospects of promotion to higher posts.

GENERAL CONDITIONS:
Five-day week, 3½ weeks Annual Leave in addition to Statutory holidays. Part-time day release for higher technical training in approved cases. Opportunities for non-contributory pensionable posts.

APPLICATIONS:
To the Chief Engineer, Ministry of Works, (A), Room 435, Abell Hse, John Islip St, London S.W.1. State age, experience, training and qualifications. Interviews at Regional Offices where possible. (R 638)

EDUCATION COMMITTEE OF THE COUNTY OF STIRLING

APPLICATIONS are invited for the post of full-time
TEACHER OF ELECTRICAL ENGINEERING

First at the County Mining Institute, Falkirk, and then at Falkirk Technical College when building is complete. The teacher appointed will be required to teach Electrical Engineering to O.N.C. level with prospects of H.N.C. work. Applicants should hold a degree, diploma or associateship. Salary will be in accordance with the Teachers' Salaries (Scotland) Regulations, 1959, with placing for industrial experience. The maximum salary will be £1,330 or £1,610 according to qualifications and level of work taught.

Further particulars and application forms may be obtained from the undersigned with whom applications should be lodged before 27 Aug., 1960.

WILLIAM J. GOLDIE,
Director of Education.

Education Offices,
Spittal St,
Stirling. (R 606)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable appointment as a THIRD ASSISTANT ENGINEER in the System Design Section of the Chief Engineer's Department at Board Headquarters.

The successful candidate will be engaged on planning the Board's distribution system for all voltages up to and including 33 kV. Candidates should have had previous experience in the construction and operation of distribution systems and some experience in their design would be an advantage. They should possess an engineering degree or qualifications for corporate membership of the Institution of Electrical Engineers.

Salary: N.J.B. Class BX, Grade 8, £925/£1,215 per annum.

Applications, quoting reference E28/60, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 29 Aug., 1960.
(R 605)

FEDERATION OF RHODESIA AND NYASALAND
Federal Power Board

APPLICATIONS are invited for the following appointments:
RESIDENT ELECTRICIAN
SALARY: £1,500.

Applicants for the post should be suitably qualified and should have had substantial experience in the maintenance of high voltage transmission lines and substations.

The successful applicant will be required to serve initially at Sherwood but may subsequently be required to serve at any of the Board's maintenance depots. There is a pension scheme which he will be required to join.

Housing and hard furniture will be provided at reasonable rental in the Que Que area. Reasonable transfer and removal expenses of the successful candidate and his family to Que Que will be paid by the Board.

Applications giving full details of education, training, experience, age and marital status should be posted so as to reach the Secretary, Federal Power Board, Reliance Hse, Moffat St, P.O. Box 630, Salisbury, not later than 7 Sept., 1960. (R 604)

CITY OF SALISBURY
Southern Rhodesia
VACANCY FOR ELECTRICAL ENGINEER
SALARY: £1,025/£1,768 2s 6d.

APPLICATIONS are invited for the post of Electrical Engineer in the Salisbury Municipal Electricity Department, on the above scale.

Commencing salary is based on qualifications and experience, with a barrier at £1,563 2s 6d per annum, above which no engineer can rise without being a corporate member of the British Institution of Electrical Engineers, and £1,614 7s 6d per annum is the maximum entry point into the grade.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

Experience in the design and planning of distribution networks and substations from L.T. 11 kV and up to and including 33 kV, the preparation of technical specifications and the compiling of investigatory reports on general distribution problems, together with general experience on mains and substation construction works on a large undertaking is essential.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital status should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Davis and Soper Ltd., 52-54 St. Mary Axe, London E.C.3, to whom applications must be submitted on or before 3 Sept., 1960. (R 603)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

STATION SHIFT CONTROL ENGINEERS
WILLINGTON POWER STATION
Vacancy No. 184/60.

APPLICATIONS are invited for the position of Station Shift Control Engineer at Willington Power Station, Willington, nr. Derby.

Applicants should have had a good general education and technical training with practical experience in the control and operation of large modern switchgear. Preference will be given to candidates who possess technical qualifications to Higher National standard.

Salary will be in accordance with Class L, Grade 10 (£1,010/£1,130 per annum) of the National Joint Board Agreement, plus 10% Shift Allowance.

Closing date for receipt of applications: 12 Aug., 1960.

STATION SHIFT CONTROL ENGINEER
LINCOLN POWER STATION
Vacancy No. 186/60.

Applications are invited for the position of Station Shift Control Engineer at Lincoln Power Station, Spa Rd, Lincoln.

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent would be advantageous.

Salary will be in accordance with Class F, Grade 10 (£745/£830 per annum) of the National Joint Board Agreement, plus £90 per annum allowance for shift duties.

Closing date for receipt of applications: 19 Aug., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned, and should be returned to the Station by the date stated.

THIRD ASSISTANT ENGINEER
(SYSTEM PLANNING)
TECHNICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 185/60.

Applicants should hold a degree or the Higher National Certificate in Electrical Engineering.

Preference will be given to candidates who have experience of fault calculations, of switchgear and protective systems and the solution of problems involving simple A.C. theory.

Duties will include power system calculations, relay settings, preparation of system diagrams and operation of D.C. and A.C. calculators.

The salary will be in accordance with Class BX, Grade 8 (£925/£1,215 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 12 Aug., 1960.

This appointment will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.
(R 609)

KUMASI COLLEGE OF TECHNOLOGY, GHANA
Department of Electrical Engineering

APPLICATIONS are invited for two posts of TECHNICAL INSTRUCTORS in the Department of Electrical Engineering

Applicants must have had a sound technical education and should possess either the Higher National Certificate or Diploma. Some experience in Technical College work will be an advantage.

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Successful candidates will take full-time classes in a four-year diploma course in electrical engineering, prepare and supervise laboratory work in electrical power, machines and measurements and assist in laboratory development and research work.

The Contract Salary Scale is £1,295 x £56—£1,855.

In addition, children's allowances are paid up to a maximum of three, and a gratuity at the end of the contract at the rate of £150 for each year of satisfactory service. The entry point is fixed according to qualifications and experience.

The College is fully residential, and members of staff are housed in pleasant modern bungalows on the spacious campus; climate and living conditions are good.

Annual leave with three free return passages in four years is granted to members of staff and their families.

Application forms and an information brochure may be obtained from the Assistant Registrar, Kumasi College of Technology, 29 Tavistock Sq, London W.C.1, who will also be glad to answer any questions about this appointment. The closing date for applications is mid-August.

(R 617)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Fife Area

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for appointment as General Assistant Engineer to undertake the duties of Surveyor with the Construction Department, East Port, Dunfermline. Applicants should have a sound experience of all types of overhead construction up to and including 33 kV.

N.J.B. Conditions and Salary Scale No. 4 —£765/£870 per annum.

Applications on standard form obtainable from Area Manager, S.S.E.B., East Port, Dunfermline, should be returned to him not later than Friday, 26 Aug., 1960.

(R 672)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER
TECHNICAL SECTION
ENGINEERING DEPARTMENT
AREA BOARD HEADQUARTERS
MANCHESTER 8

Second Advertisement

APPLICATIONS are invited for a position as Third Assistant Engineer to assist with a variety of interesting investigations arising from the operation of an extensive distribution system ranging from dense city networks to scattered rural systems and operating at voltages up to 33 kV.

A sound technical education and training is essential and experience of operational work on an electricity supply system would be an advantage.

Salary Scale: £925/£1,215 p.a., Class BX, Grade 8. N.J.B. Conditions.

Application forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 3 Sept., 1960.

(R 607)

ANTARCTICA

VACANCY exists for a DIESEL MECHANIC with FALKLAND ISLANDS DEPENDENCIES SURVEY in the Antarctic for two years. Salary is at basic rate of £500 a year. Whilst in the Antarctic everything is provided free of charge including clothing, cigarettes, etc. Generous cash payment on completion of service.

Candidates, between 20 and 30 years of age and preferably single must be capable of maintaining small petrol or diesel generating plant and be able to install and maintain elementary electrical circuits.

Successful candidate will be required to leave the U.K. in October/November. Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/50974/EE. (R 611)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

STATION SHIFT CONTROL ENGINEER
LINCOLN POWER STATION
Vacancy No. 186/60.

APPLICATIONS are invited for the position of Station Shift Control Engineer at Lincoln Power Station, Spa Road, Lincoln.

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be advantageous.

Salary will be in accordance with Class F, Grade 10 (£825/£940 per annum) of the National Joint Board Agreement, plus shift enhancement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
WILLINGTON "A" AND "B" POWER STATIONS
Vacancy No. 191/60.

Applications are invited for the position of Assistant Maintenance Engineer (Electrical) at Willington Power Station, near Derby.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
5 Aug., 1960. (R 642)

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division

GENERAL ASSISTANT ENGINEER
ALDERSHOT TRANSMISSION SECTION
SEC/3.104

DUTIES of the post will be those related to the maintenance and operation of high voltage transforming stations and grid lines.

Applicants should have had a sound general and technical education and preference will be given to those possessing an appropriate Higher National Certificate or equivalent qualifications.

Salary: N.J.B. AX 15, £645/£805.

Special application forms (not AE6/ACT) obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 23 Aug., 1960. (R 639)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONTRACTING ENGINEER

REQUIRED in the Liverpool Central District of the Board's No. 1 Sub-Area.

Salary within range £845/£930 per annum (N.J.B. J/11).

Candidates should have had experience of electrical contracting, including estimating and supervision of work on site.

Appointment subject to medical examination. Pension Scheme.

Special application forms, available from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be completed and returned not later than 19 Aug., 1960.

(R 626)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

LONDON COUNTY COUNCIL

South East London Technical College

GRADE B LECTURER

TO teach up to H.N.C. standard in Electrical Engineering Department. Graduate preferred.

Salary (men) within the range £738/£1,486; point of entry and maximum depending on age, qualifications, training and experience.

Application forms from Secretary at College (FE3a/ET/2076/8), Lewisham Way, London S.E.4, returnable within two weeks of advertisement date. (R 656)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions at Drakelow Power Station, near Burton-on-Trent.

ASSISTANT ENGINEER (EFFICIENCY)
DRAKELOW "A" AND "B" POWER STATIONS

Vacancy No. 192/60.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT ENGINEER (PLANNING)
DRAKELOW "A" AND "B" POWER STATIONS

Vacancy No. 193/60.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL)
DRAKELOW "A" AND "B" POWER STATIONS

Vacancy No. 194/60.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional Institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER (MECHANICAL)
DRAKELOW "A" AND "B" POWER STATIONS

Vacancy No. 195/60.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be

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obtained from the Station Superintendent and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
4 Aug., 1960. (R 641)

LONDON ELECTRICITY BOARD

ARCHITECTURAL DRAUGHTSMAN

APPLICATIONS are invited for the above position in the Architect's Section of the Construction Branch of the Chief Engineer's Department at Lesco House, Stamford St, S.E.1.

Applicants should be neat draughtsmen and preferably have had several years' experience in an Architect's office.

Pending determination as to the grading of the post within Schedule B of the National Joint Board Agreement, the salary will be in the provisional range £755 per annum rising to £855 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, London, E.C.2, to be returned completed within fourteen days of the publication date of this notice. Please quote ref: PER/V/3054/T. (R 646)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

CROYDON "B" GENERATING STATION
Vacancy No. 169/60T.
ASSISTANT ENGINEER (RELIEF)

THE successful applicant will be required to undertake relief duties primarily as Assistant Engineer (Control) and to assist generally in the various aspects of the work of the Station. Candidates should have a suitable engineering background and should preferably have had technical training to at least O.N.C. level.

Salary: N.J.B. Class J, Grade 14, £805/£920 per annum including London Allowance, plus shift allowance when applicable.

Application giving age, details of experience, qualifications etc., should be sent to the Station Superintendent, Croydon "A" and "B" Power Stations, Beddington Farm Rd, Croydon, Surrey, to arrive by 22 Aug., 1960.

W. H. DUNKLEY,
Divisional Controller.
(R 640)

EASTERN ELECTRICITY BOARD

Chief Engineer's Department, Area Headquarters

SECOND ASSISTANT ENGINEER
(DEVELOPMENT SECTION)

CANDIDATES should have had a sound general education and technical training, with experience in the design of 33 kV and lower voltage urban and rural distribution systems, system calculations and the preparation of reports and estimates. Experience of budgeting procedure is desirable. Corporate Membership of the I.E.E. or equivalent qualifications will be an advantage.

Salary: N.J.B. Class BX, Grade 5 (£1,375/£1,720).

The successful candidate will be required to contribute to a Superannuation Scheme and may be required to undergo a medical examination.

Apply by letter to the Chief Engineer, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 6 Sept., 1960. (R 643)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
WEST KENT DISTRICT

SALARY £825/£940, plus London Allowance, under N.J.B. Agreement Class G, Grade 11. Superannuable. Applicants should have technical qualifications up to H.N.C. standard with training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. Applications, quoting ET on forms from District Manager, Seeboard, 286 High St, Orpington, by 24 Aug., 1960.

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CARTOGRAPHIC DRAUGHTSMAN
CROYDON AND PURLEY DISTRICT

Salary £740 x £25—£815 per annum including London Allowance under N.J.C. Grade 2. Superannuable. Applicants should have a good general education, experience in a distribution drawing office, and be fully conversant with mains recording and preparation of system diagrams, etc. Applications, quoting ET, on forms from District Manager, Seeboard, Electric House, Wellesley Rd, Croydon, by 24 Aug., 1960.

ASSISTANT DISTRICT ENGINEER
WORTHING DISTRICT

Salary £965/£1,090 p.a. N.J.B., Class F, Grade 8. The district may be reclassified next year. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. Rented housing accommodation is available. Applications, quoting ET and naming two referees, to District Manager, Seeboard, 56 Chapel Rd, Worthing, by 24 Aug., 1960.

SENIOR ASSISTANT ENGINEER
(PLANNING)
CROYDON AND WEST KENT SUB-AREA HEADQUARTERS

Salary N.J.B. Class K, Grade 4, £1,650/£1,830, plus London Allowance. Applicants should be Corporate Members of the I.E.E. and have had wide experience of distribution engineering. The duties of the appointment will consist of planning and design of underground and overhead distribution systems up to and including 33 kV, also estimating and preparation of schemes for submission for approval. Applications, quoting ET and naming two referees, on forms from Croydon and West Kent Area Manager, Seeboard, Electric House, Wellesley Rd, Croydon, by 24 August, 1960.

SENIOR ASSISTANT
(ESTATES AND WAYLEAVES)
KENT AREA HEADQUARTERS
ROCHESTER

Salary: £890 x £30—£1,010 per annum on N.J.C., Grade 4. Superannuable. Applicants must be of good education and have experience in all matters affecting estate management, including negotiations for the acquisition of land and wayleaves, Town and Country Planning, valuation of crops and timber, and be familiar with the appropriate statutory requirements. Membership of an appropriate professional organisation would be an advantage. Applications, quoting ET and naming two referees, to Kent Area Manager, Seeboard, 178-184 High St, Rochester, Kent, by 24 Aug., 1960.

ASSISTANT DISTRICT ENGINEER
SUTTON DISTRICT

Salary: £965/£1,090 p.a. under N.J.B. Class G, Grade 9, plus London Allowance. Superannuable. Applicants should have had a good general education, be technically trained up to Higher National Certificate standard and must have had practical experience in general distribution work on H.V. and L.V. systems. Ability to plan and prepare schemes for mains extensions would be an advantage. Applications, quoting ET and naming two referees, on forms from the District Manager, Seeboard, 52 High St, Sutton, Surrey, by 24 Aug., 1960.

ASSISTANT DISTRICT ENGINEER
SUTTON DISTRICT

Salary: £825/£940 p.a. plus London Allowance under N.J.B. Class G, Grade 11. Superannuable. Applicants should possess the Higher National Certificate in electrical engineering and have had a thorough training in underground and overhead distribution systems. Applications, quoting ET and naming two referees, on forms from the District Manager, Seeboard, 52 High St, Sutton, Surrey, by 24 Aug., 1960.

E.H.T. JOINTERS
HERNE BAY/CANTERBURY DISTRICT

Wages 5s 1½d per hour for a 42-hour 5-day week under N.J.I.C. Agreement. Applications, quoting ET and naming two referees, to the Joint District Managers, Seeboard, 65 Mortimer St, Herne Bay, by 22 Aug., 1960.

GEORGE WRAY,
Secretary.
(R 654)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

SECOND ASSISTANT ENGINEER
(CONSTRUCTION, MAINTENANCE AND OPERATION)
CHIEF ENGINEER'S DEPARTMENT
HEAD OFFICE, BRISTOL

THIRD ASSISTANT ENGINEER (TECHNICAL)
CHIEF ENGINEER'S DEPARTMENT
HEAD OFFICE, BRISTOL

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
EAST CORNWALL
BASED AT LOOE BRANCH

THIRD ASSISTANT DISTRICT ENGINEER (PLANNING)
PLYMOUTH

FOURTH ASSISTANT DISTRICT ENGINFER (CONSTRUCTION)
EXETER

Closing Date for Receipt of Completed Applications is Monday, 29th August, 1960

SECOND ASSISTANT ENGINEER
(CONSTRUCTION, MAINTENANCE AND OPERATION)
CHIEF ENGINEER'S DEPARTMENT,
HEAD OFFICE, BRISTOL

Salary according to Class AX, Grade 5, Salary Scale 13—£1,180/£1,410 per annum—of Schedule B of the N.J.B. Agreement.

Candidates should possess extensive knowledge of and have had wide experience in all branches of distribution engineering, and in particular of the design, maintenance and construction of overhead lines, underground cables and substations up to 33 kV.

Duties will include investigation into present methods of working, preparation and inspection of reports and assisting in promoting a progressive engineering development policy. Some operational experience is essential.

Possession of Graduate or Associate membership of the IEE or equivalent qualification and the possession of current driving licence are desirable.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the Establishments Officer, South Western Electricity Board, Electricity House, Colston Ave, Bristol 1. Closing date: 29 Aug., 1960.

THIRD ASSISTANT ENGINEER (TECHNICAL)
CHIEF ENGINEER'S DEPARTMENT,
HEAD OFFICE, BRISTOL

Salary within Class AX, Grade 7, Salary Scale 11—£1,005/£1,215 per annum—of Schedule B of the N.J.B. Agreement.

The primary duties of the engineer appointed will be in connection with the design and running of small generating plants. The successful candidate may also be required to assist in the design, testing and maintenance of protective systems associated with the Board's high voltage network, and he may also be required to carry out a range of technical investigations.

Possession of Graduate or Associate membership of the IEE or equivalent qualification and the possession of a current driving licence are desirable.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the Establishments Officer, South Western Electricity Board, Electricity House, Colston Ave, Bristol 1. Closing date: 29 Aug., 1960.

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
EAST CORNWALL
BASED AT LOOE BRANCH

Salary within Class E, Grade 8, Salary Scale 6—£800/£875 per annum—of Schedule A of the N.J.B. Agreement.

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The candidate appointed will be responsible to the District Commercial Engineer, East Cornwall, for the efficient operation of the commercial functions in the Looe/Polperro area. Duties will include commercial development, with emphasis on commercial catering, etc., public lighting, load development and an efficient consumer service, sales and electrical installation contracting, etc., and may include switching under instructions. The successful applicant will be based at Looe.

Technical qualifications at least equivalent to the Higher National Certificate in Electrical Engineering, an all-round commercial experience and the ability to control staff will be an advantage. The possession of a current driving licence is desirable.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Luxstowe, Liskeard. Closing date: 29 Aug., 1960.

THIRD ASSISTANT DISTRICT ENGINEER (PLANNING)
PLYMOUTH

Salary within Class G, Grade 9, Salary Scale 7—£845/£930 per annum—of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the planning and technical work relating to construction of substation equipment up to and including 33 kV and also for both overhead and underground systems. The person appointed may be required to undertake standby duty and he will be a Senior Authorised Person.

Possession of appropriate technical qualifications at least equivalent to the Higher National Certificate in Electrical Engineering is necessary and a current driving licence is desirable.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Elliott Rd, Prince Rock, Plymouth. Closing date: 29 Aug., 1960.

FOURTH ASSISTANT DISTRICT ENGINEER (CONSTRUCTION)
EXETER

Salary within Class G, Grade 11, Salary Scale 5—£745/£830 per annum—of Schedule A of the N.J.B. Agreement.

The successful candidate will be required to undertake general duties on the construction of the E.H.V, H.V. and L.V. networks and supervision of repair work, when necessary. He may be required to carry out standby duties.

Applicants should have had some experience in the construction, operation and maintenance of underground and overhead distribution systems, and possession of the Higher National Certificate in Electrical Engineering would be an advantage. The ability to drive a car and possession of a current driving licence is desirable.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 3 Bedford St, Exeter. Closing date: 29 Aug., 1960. (R 647)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1239)

READING District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 10 (£1,040/£1,165 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations, and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1238)

Oxford District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 10

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(£1,040/£1.165 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations, and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1237)

Reading District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 11 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

GENERAL ASSISTANT ENGINEER
(Z.1236)

Newbury District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class F, Grade 13 (£670) rising to the maximum of Grade 12 (£805). N.J.B. Conditions of Service.

The duties of the post will be to assist with distribution including minor construction work and general maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant, etc. Applicants should possess suitable technical qualifications.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications for these appointments on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting the appropriate "Z" Number, not later than 22 Aug., 1960. (R 648)

FEDERAL GOVERNMENT OF NIGERIA

TECHNICAL INSTRUCTOR
(ELECTRICAL PRACTICE)

TECHNICAL Instructor (Electrical Practice) required by the Government of the Federation of Nigeria to give instruction in Electrical Practice at the Yaba Technical Institute, Lagos.

The candidate must have served a full apprenticeship and be an experienced practical tradesman. He should possess a Final City and Guilds Certificate in Electrical Engineering Practice which must include in Part II of the Final, Sections B and C—Generation and Transmission, and Distribution, etc., or a City and Guilds Electrical Technicians' Certificate in Power Generation and Supply. It would be an advantage if the candidate could offer instruction in Radio Service Work, and preference will be given to candidates having experience of apprenticeship training or teaching. Minimum age 25 years.

Appointment on contract for up to three institutional tours of 9-10 months with prospect of extension. Salary according to qualifications and experience £936/£1,554 per annum including Inducement Addition. Gratuity of £100/£150 per annum for satisfactory service. Outfit allowance of £60. Free passages for officer and wife. Liberal leave on full pay. Quarters at low rent. Income tax at low local rate. Assistance towards children's passages, or grant of allowance while separated.

Write for application forms and further particulars, stating briefly age, qualifications and experience, to the Appointments Secretary, Federal Public Service Commission, Nigeria Hse, 9 Northumberland Ave, London W.C.2, quoting G.17/13.

(R 653)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT ENGINEER
(DIVISIONAL HEADQUARTERS)

FOURTH Assistant Engineer required in the Electrical Department at Divisional Headquarters.

N.J.B. Agreement conditions. Superannuable appointment. Salary within Schedule B, Class BX, either Grade 9, 10 or 11, according to qualifications and experience. The salary ranges are as follows:

Grade 9, £1,005/£1,325 per annum.
Grade 10, £935/£1,245 per annum.
Grade 11, £855/£1,165 per annum.

Candidates should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification and should have had some experience on equipment associated with E.H.V. transmission. Previous applicants for this position need not apply.

Apply, quoting Vacancy No. 213/60MD, on form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, to reach him not later than 24 Aug., 1960. (R 655)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEERS
(TWO)

APPLICATIONS are invited for the above positions in the Board's North Eastern District at Church Hill, Walthamstow, E.17.

Applicants should have had a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class G, Grade 11, £875 per annum rising to £990 per annum, inclusive of London Area Allowance.

Application form obtainable from Personnel Officer, 46 New Broad St, London E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote reference: PER/V/3001/T. (R 651)

THE SOUTH WALES ELECTRICITY BOARD

Architectural Assistants

APPLICATIONS are invited for the following posts in the Chief Engineer's Department at Head Office, St. Mellons:

SECTION LEADER
(ARCHITECTURAL ASSISTANT)

Salary: N.J.B. Class AX Grade 9 Scale 9 (£1,005/£1,245 per annum).

The successful applicant will receive a commencing salary of at least £1,115 per annum.

TWO SENIOR ARCHITECTURAL ASSISTANTS

Salary: Class AX Grade 12, Scale 6 (£780/£1,015 per annum).

The successful applicants will receive a commencing salary of at least £890 per annum.

Applicants should preferably be of Intermediate R.I.B.A. standard.

Applications stating age, present posiont, present salary, qualifications and experience should be addressed to the undersigned at St. Mellons, Cardiff, so as to arrive not later than 26 Aug., 1960. Please quote reference 137/60/ET.

Envelopes should be endorsed "Architectural Assistants."

R. G. WILLIAMS,
Secretary.
(R 650)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

ELECTRICAL DEPARTMENT
NORTHFLEET DISTRICT

Vacancy No. 173/60.

THIRD ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

REQUIRED to act as assistant to the Operation and Maintenance engineer. Candidates should have qualifications which will lead to corporate membership of the I.E.E. and be familiar with the operation and maintenance of all high voltage equipment including overhead lines.

Salary: Class AX, Grade 8, £1,155/£1,375 per annum including London Allowance.

Applications giving age, details of experience, qualifications etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 25 Aug., 1960.

W. H. DUNKLEY,
Divisional Controller.
(R 645)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

FIRST ASSISTANT DISTRICT
COMMERCIAL ENGINEER
BRISTOL

FIRST ASSISTANT DISTRICT
COMMERCIAL ENGINEER
MID CORNWALL

Closing Date for Receipt of Completed Applications is Monday, 29th August, 1960

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
BRISTOL

Salary according to Class K, Grade 7, Salary Scale 12—£1,155 to £1,305 per annum—of Schedule A of the N.J.B. Agreement.

The successful candidate will be responsible to the District Commercial Engineer for all aspects of the work of the Central Contracting Unit now being formed, including the preparation, submission and, where successful, completion of tenders for electrical installation work. To keep in close touch with Electrical Contractors, Architects, Local Authorities and Builders and to take such other steps as may be necessary to establish the new contracting organisation and maintain a close liaison with the Commercial Districts.

Possession of appropriate technical qualifications at least equivalent to the Higher National Certificate in Electrical Engineering is necessary, and a current driving licence is desirable.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Electricity House, Colston Ave, Bristol 1. Closing date: 29 Aug., 1960.

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
MID CORNWALL

Salary within Class F, Grade 5, Salary Scale 10—£1,010 to £1,130 per annum—of Schedule A of the N.J.B. Agreement.

The successful applicant will be responsible to the District Commercial Engineer for the Supply Section of the Commercial Department, and his duties will include Rural Development, Consultative Council and Parliamentary correspondence, Housing Estates, Tariffs, Technical Services (floorwarming, commercial catering, etc.), Public Lighting, Contracting and Testing.

Applicants must have good experience in District Commercial work and the posses-

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sion of a technical qualification will be an advantage.

Applications to be made on Standard Form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, St. Petrocs, Bodmin, Cornwall. Closing date: 29 Aug., 1960. (R 666)

AIR MINISTRY

Works Designs Branch

REQUIRES in London and Provinces ENGINEERING DESIGNER DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution. Candidates should have served a recognised apprenticeship or had equivalent training and also have had practical experience. O.N.C. an advantage. Financial assistance and time off given for recognised courses of study. Promotion and pension prospects. Five-day week with 18 days' paid leave per year initially. Overseas tours for which special allowances granted. Salary: in London ranges from £680 (at age 25) to £900 p.a. for men; from £673 to £868 for women. Somewhat lower in Provinces. Commencing salary dependent on age, qualifications and experience. Applicants, who must be natural born British subjects, should write to Air Ministry, W.G.d., Lacon Hse, Theobalds Rd, London W.C.1, or apply to any Employment Exchange quoting King's Cross 896, giving age, details of training, qualifications, full particulars of former posts held and copies of any testimonials. Candidates selected will normally be interviewed in London and certain expenses reimbursed. (R 283)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

APPOINTMENT OF SENIOR ASSISTANT ENGINEER

ELECTRICAL MEASUREMENTS SECTION
TECHNICAL DEPARTMENT

APPLICATIONS are invited for the appointment of a Senior Assistant Engineer to take charge of the Electrical Measurements Section with location at Darlington.

Candidates should have a wide theoretical and practical knowledge of electrical measurements and be corporate members of the Institution of Electrical Engineers. Responsible experience in the application and maintenance of integrating meters and indicating instruments in large high-voltage circuits, and of the administration of this work, is required.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Class AX, Grade 3 (£1,365/£1,605 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 22 Aug., 1960. (R 658)

B.B.C. requires ENGINEER in the Special Systems Group, Designs Department. Candidates should be British subjects and have a suitable degree or its equivalent. The duties will include dealing with special design projects in a wide field embracing radio, television and sound. This calls for a good knowledge of electronic circuitry and networks, keen interest in design, capacity for original work, and the ability to carry a project to a successful completion. Interest in receivers and low power transmitters as used in special broadcast links is an advantage. The varied nature of the work demands an engineer with good versatility. Salary in scale £1,230/£1,580 p.a. Application forms may be obtained from Engineering Recruitment Officer (ref. 60.E.105.E.T.), Broadcasting Hse, London W.1. (R 613)

DOMESTIC APPLIANCE TESTING
E.D.A. Testing House

To meet additional demands for the testing of domestic electrical appliances for the British Electrical Approvals Board, the British Standards Institution and the Electricity Boards, the Electrical Development Association's modern and well equipped laboratories at Leatherhead, Surrey, are being extended. Vacancies now exist for:—

SECTION HEAD: A senior position calling for wide experience in the testing of domestic appliances and a good knowledge of British Standards, coupled with the ability to control a department and discuss technical problems with others. Applicants should possess at least the Higher National Certificate in Electrical Engineering or Physics or its equivalent.

ASSISTANT SECTION HEAD: A supervisory position calling for similar qualifications, but a younger man would be considered.

TEST ENGINEERS AND ASSISTANT TEST ENGINEERS: Several interesting posts for those with experience in the testing of electrical equipment. H.N.C. or equivalent qualification desirable for the higher posts.

Attractive salaries commensurate with qualifications and experience will be paid. Good conditions of service include contributory pension scheme, free life insurance, five-day week, canteen facilities, etc. In addition, financial assistance may be available in cases where suitable candidates are faced with housing difficulties.

Apply in writing to the Director and Secretary,
Electrical Development Association,
2 Savoy Hill, London W.C.2

(R 616)

ASSISTANT TEST ENGINEER — for new Testing Laboratory dealing with electrical wiring accessories, cartridge fuses, etc. Applicants should have at least O.N.C. or equivalent, and have had previous experience in a similar capacity. A good salary will be offered according to age, experience and qualifications. Applications treated in strict confidence if addressed to Technical Manager, M.K. Electric Ltd., Shrubbery Rd, Edmonton, N.9. (R 624)

ARMATURE WINDERS required—good remuneration to suitable applicants.—Dow and Nicholson Ltd., 10 Wellington Pl, Aberdeen. (R 622)

BRITISH RAILWAYS (Southern Region) require an ELECTRICAL ENGINEERING TECHNICAL ASSISTANT in the London Area associated with the planning, supervising of installation, testing and commissioning of 660/750 V D.C. overhead contact wire systems: also high and low voltage cables and electric track equipment for a third rail system. Ability to assist with technical estimates, correspondence and reports. Technical qualifications to Higher National Certificate standard essential.

Salary Range: £875 p.a. to £948 p.a.

Application forms may be obtained from the Chief Mechanical and Electrical Engineer, British Railways, Southern Region, 15 St. Thomas St, London Bridge, S.E.1. (R 623)

DRAUGHTSMAN

for work in connection with railway electrification grid and super grid stations. Applicants should have some experience in protection schemes and be capable of working on own initiative in a small but expanding section.

Commencing salary range: £806/£950 per annum.

Evening or Saturday morning interview may be arranged. Give details of age, experience and qualifications to: Fuller Electric Ltd., Walthamstow, London E.17. (R 614)

CONSULTING Engineer requires ELECTRICAL ENGINEER for interesting and varied work. Educational standard should be H.N.C. Five-day week and non-contributory pension scheme. Apply in writing, giving age, education, experience and salary to: Messrs Mackness and Shipley, Parliament Mansion, Abbey Orchard St, London S.W.1, quoting Ref. P. 1210. (R 659)

CONSULTING Engineer requires ELECTRICAL ENGINEER/DRAUGHTSMAN, aged 20/25, to assist in the preparation of installation design on projects mainly large and interesting, including Universities, Hospitals, Commercial Development and Industrial expansion schemes, etc. Minimum qualifications O.N.C. Meal vouchers and superannuation scheme. Applicants must state age, educational background, qualifications, experience and salary required. G. H. Buckle and Partners, 2 Harrington Gdns, London S.W.7. (R 663)

DRAUGHTSMAN required for Consulting Engineer's office, to assist in the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (R 662)

EXCELLENT opportunity for TRANSFORMER DESIGNER in Bombay. Preferably single man aged between 35/45 years, having degree in Electrical Engineering from recognised University or equivalent diploma. Good physique, strong personality, able to deal with and influence Government Officials and Engineers at top level. At least 5—8 years' experience with leading Electrical Manufacturer in design and production dealing with Power Transformers up to 10,000 kVA at 136 kV. Able to design independently and improve existing designs in line with best modern practice. Production organising ability. Good salary and prospects with Service Agreement to suitable applicant. Write Box No. 7953, Electrical Times. (R 669)

ELECTRICAL DRAUGHTSMAN able to apply himself to a wide variety of work. A knowledge of power switchboard construction would be an advantage.—Astral Switchgear Ltd., Alma Rd, Ponders End, Middlesex. (R 620)

ELECTRICAL ENGINEER

Burma Corporation (1951) Ltd., a large Mining Company operating in Upper Burma, climate sub-tropical and healthy, has a vacancy for an Electrical Engineer. Applicants must be suitably qualified and have had not less than seven years' practical experience in electrical installations comprising maintenance and testing factory installations, sub-stations, overhead lines, motors, etc., etc., and preferably also underground electrical equipment and cables.

Four years' agreement; six months' paid leave of which three months normally permitted after two years; contributory Provident Fund, free passage, partly furnished quarters and medical attention.

Commencing salary and allowances aggregate K.1,325 (£99 7s 6d) per month, rising to K.1,475 (£110 12s 6d) in fourth year.

Advise fullest details education, qualifications, experience, age and family status.

Write Box S.636, W.P.S., 4 Holborn Circus, London E.C.1. (R 664)

ELECTRICAL, MECHANICAL, CIVIL ENGINEERS EXPERIENCED in Overhead Transmission Lines, Steel Towers and Wood Poles, also engineers experienced underground cable contracts, designers, surveyors, profilers, draughtsmen—vacancies for all grades. Required for Head Office and Site Work, by large Scottish Organisation of Contractors for work in all areas of the United Kingdom. This is an opportunity to join an expanding and progressive company with diverse activities in the Electrical Installation Contracting Field. Good prospects and superannuation. Write giving full particulars of experience and qualifications, age, married or single, starting salary expected. Give permanent address. Applications, treated strictly confidential, to Box No. 7951, Electrical Times. (R 668)

LIGHTING DESIGN ENGINEER

PHILIPS ELECTRICAL LTD. require an Engineer in their South East Regional Office for planning a wide variety of Lighting Schemes. Some knowledge of this work is necessary, but the post will give the opportunity to gain further training and experience in this field.

This is a pensionable post with progressive conditions of employment. Please write with all details to the

Employment Officer,
Century House,
Shaftesbury Avenue,
London W.C.2,
quoting Ref. 463. (R 636)

ELECTRICAL ENGINEER required for Consulting Engineer's office, to carry out the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (R 661)

ELECTRICAL ENGINEER required for Glasgow Office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (R 660)

ELECTRICAL ENGINEER with first-class qualifications required to take charge on the Electrical Design and Development Sections of a firm manufacturing electric trucks and equipment. This is a senior position requiring ability, initiative and responsibility. Some knowledge of electronics is desirable but not essential. Our staff are aware of this advertisement. Particulars of experience, qualifications, etc., should be forwarded to Box No. 7955, Electrical Times. (R 670)

ELECTRICAL CONTROL ROOM ASSISTANTS are required at Windscale and Calder Works, Cumberland, to be responsible on shift for the Electrical Control Room. The work includes synchronising and loading of turbo-alternators, E.H.V. switchgear and meter reading.

Applicants must have served a recognised engineering apprenticeship and have had experience in the above duties. Possession of an O.N.C. may be an advantage.

Salary scale: £740 (at age 26)—£925 p.a.

Additional payments are made for regular shift work.

Contributory Superannuation. Staff Housing Scheme.

Send postcard for application form quoting reference P/W.39/J8 to: Recruitment Officer, U.K.A.E.A., Production Group, Windscale Works, Sellafield, Seascale, Cumberland.

Closing date: 29 Aug., 1960. (R 621)

LIFT ENGINEER required by Insurance Company for inspection of lifts. Must have served apprenticeship with lift construction firm and hold at least O.N.C. or equivalent in Electrical or Mechanical engineering. London. Starting salary: £800 p.a., pension, widows' pension, etc. Write with full details to Box ET728, LPE Romano Hse, 399/401 Strand, London W.C.2. (R 637)

SWITCHGEAR SALES ENGINEER required for London office of firm specialising in the manufacture of overhead line isolators and fusegear. Should be a trained switchgear engineer and would be responsible for all sales in the Home Counties. Car provided. Applicants should state age, married or single, experience and salary expected. Apply: Ref. WEB/ Switchgear and Equipment Ltd., Southam Rd, Banbury. (R 596)

SENIOR OVERHEAD LINE ENGINEER having experience in design, planning and construction of overhead lines, both lattice steel tower and pole type, up to 132 kV. Must be prepared to work both at home and abroad and should have minimum qualification of A.M.I.E.E. or equivalent. Age 35-45. Position is pensionable. Apply giving full details of qualifications and experience to Personnel Officer, Ewbank and Partners Ltd., Engineering Consultants, Grosvenor Pl, S.W.1. (R 619)

SUPERVISING ENGINEER required for well-known London electrical contractor, able to handle works of any size from estimate to account. Apply stating age, experience and salary required to Box No. 7947, Electrical Times. (R 589)

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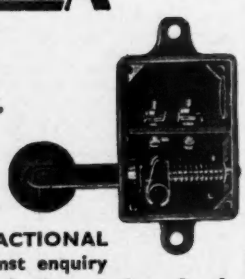

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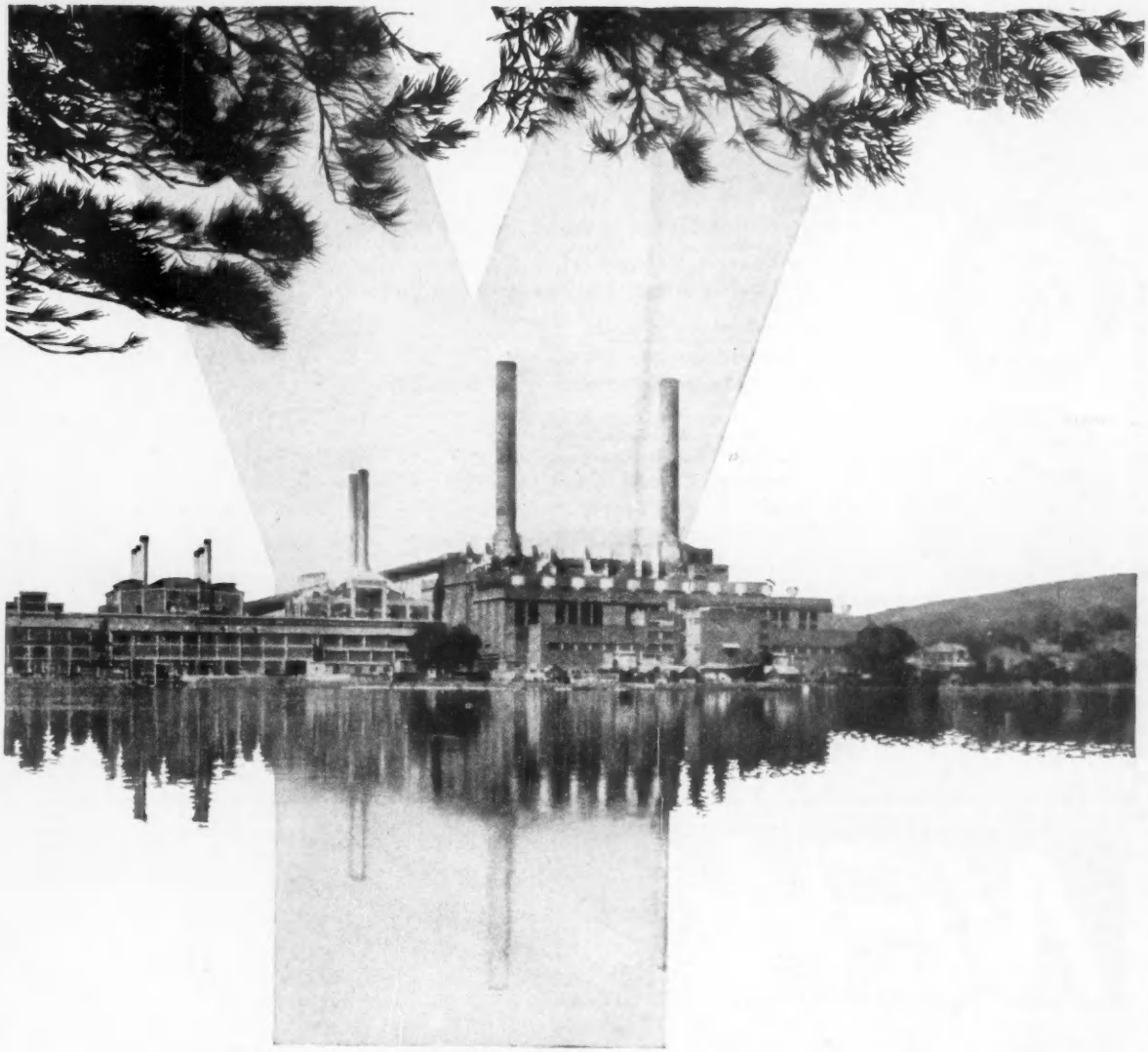

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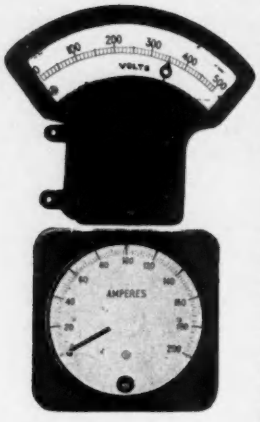

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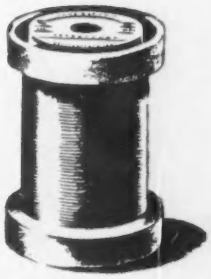

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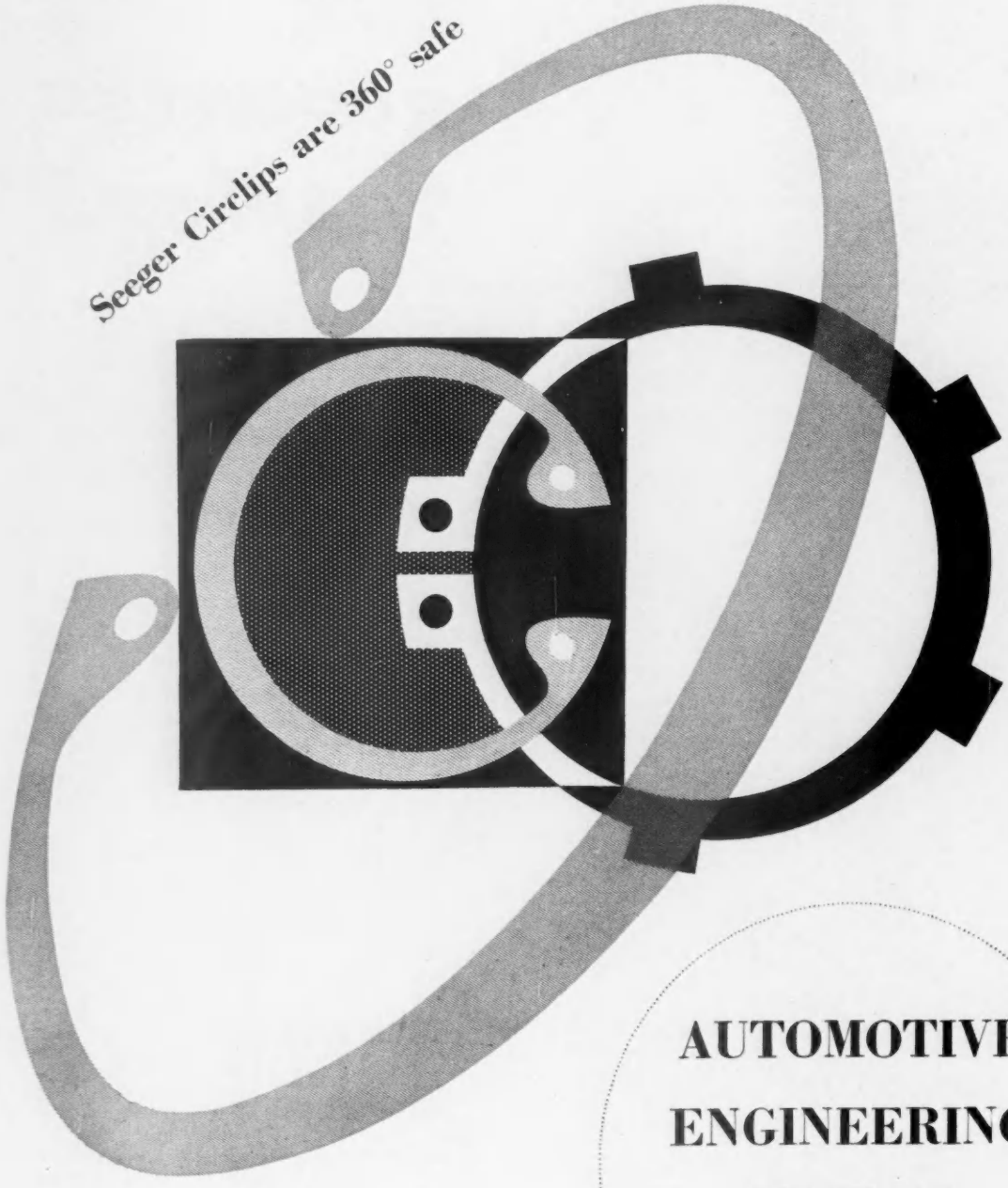

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